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ETHNOLOGY.—*The Cherokee Green Corn Medicine and the Green Corn Festival.*[1]

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The Cherokee in former times celebrated a major harvest festival, primarily concerned with the ripening corn. This was the New Corn Festival, held in August when the green corn first became fit to eat. It marked the beginning of the winter half of the year. This festival appears to have been similar to the Green Corn Festival or Busk of the Creek Indians, of which we have much more reliable and complete accounts, but the Cherokee data are sparse, and there are few characteristics by which we can distinguish the Green Corn Festival of the Cherokee from that of the Creek.[2]

Among the Cherokee of Qualla Reserve, North Carolina, the Green Corn Festival seems to have been the last important major ceremony to survive. Mooney, in 1914, states that he saw the last Green Corn Dance performed there in 1887 and mentions that he had seen the performance of a related festival as late as 1914. This account follows.

By special permission of some of the Indian priests Mr. Mooney was able to be present for the second time at the family ceremony of invoking the blessing upon the new corn and on those about to partake of it for the first time. This ceremony, probably never witnessed by another white man, is still strictly observed in private at their homes by most of the full-blood families before tasting the new corn of the season, the priests who conduct the rite going, while yet fasting, from house to house through the settlement for that purpose. The so-called Green Corn Dance, the great tribal celebration of thanksgiving for the new corn, was last performed in 1887, on which occasion Mr. Mooney was also present.[3]

Opportunity was also afforded for special studies and observations, particularly of the ceremonial "going to water," and augury with the beads to forecast the health prospect and life-span of each member of the family, before partaking of the first corn of the new crop.[4]

Dr. F. G. Speck, during the course of his extensive study of surviving Cherokee dances, found the opportunity to observe and describe a third Green Corn Ceremony still in existence in the Big Cove Community of Qualla Reserve.[5] This ceremony,

[1] This study was made possible by a grant-in-aid, for field work among the Eastern Cherokee, from the Department of Anthropology Research Funds of 1944 and 1945 of the University of Pennsylvania. Received February 7, 1946.

[2] The only original accounts of the Cherokee Green Corn Festival with which I am familiar are: The unpublished description by John Howard Payne, written in 1836, included in the Payne Manuscripts in the Ayer Collection, Newberry Library, Chicago, and described by Dr. William H. Gilbert (*The Eastern Cherokee*. Bur. Amer. Ethnol. Bull. 133: 388–401. 1943); and the account dictated by Charles Hicks, which is presented later in this paper. A comparative study of the Green Corn and harvest festivals of the Southeastern Indians, now being carried on by the author, may result in a better understanding of the nature and function of these ceremonies, but until such an investigation has progressed further, we must leave the comparison in this incomplete state.

I have in this paper attempted to restrict the term "Green Corn Festival" to the old periodic green-corn observance and "Green Corn Feast" to the modern curing ceremony, and "Green Corn Medicine" to the herb tea now used by itself and formerly employed as a feature of the Green Corn Festival.

[3] *Explorations and field work of the Smithsonian Institution for 1914.* Smithsonian Misc. Coll. 65 (6): 72–73.

[4] *Explorations and field work of the Smithsonian Institution for 1913.* Smithsonian Misc. Coll. 63 (8): 64.

[5] SPECK, F. G., Manuscript on *Eastern Cherokee songs and dances.*

however, is not held at any fixed time and seems to have lost all connection with the cycle of the agricultural year. It is performed for curative purposes at whatever time it may be needed by persons suffering from specified ailments and is accompanied by a feast provided by the patients and their families. Apparently one sequence of the old agricultural festival has continued its existence after the passing of the Green Corn Festival and has come into new associations, perhaps long before the major, fixed ceremony had been discontinued.

Will West Long, of Big Cove, dance leader and authority on Cherokee tradition, is familiar with the current Green Corn Feast, and he functions as a leader on occasions when its performance is required. He has not seen the periodic Green Corn Festival. However, drawing on information which he received from his mother, and from his older brother, he was able to supply some information about this extinct ceremonial complex.

Will West Long's information reveals that this Green Corn Festival was held the night before the first corn was to be eaten. A medicine was first prepared, and an emetic was drunk by everyone present, followed by "going to water."[6] Then the medicine was administered to all who were present at the ceremony. A formula may have accompanied the going to water,[7] but no formula was required as an accompaniment to the medicine that followed.[8] Then a series of "animal" and social dances followed, lasting all night. This dance series seems to have been the same as that found in the Green Corn Feast used for curative purposes as described by Dr. Speck.

In the morning the conjuror who served as dance leader took all the people "to water" again and then examined each person with the beads and cloth to see whether they would live until the next year's Green Corn Festival. In this form of divination the conjuror places two beads (glass beads were used in recent times, but these are said to have replaced certain seeds that the Cherokee formerly obtained at a distance), one black and one red or white, on a piece of white cloth, the red (or white) bead to the conjuror's right. The cloth is provided by the person being examined and is given to the conjuror as a token payment. The conjuror then speaks to the beads after a fixed formula, asking first the red bead if the person is to live until the next year and then asking the black bead the same question. If the red bead moves by itself, the person is expected to survive the year, and if the black bead moves, the patient will not live the year out.[9]

In case the divination indicated that someone would not live that long, a similar Green Corn Feast was held at night. Dances

[6] The "going to water" ordeal is an important item in Cherokee ritual. The purifying nature of the river was resorted to as a cleansing and protective symbol at almost any crisis in the life of the Cherokee individual or community. This formalized ceremonial bathing in the water of the river became an integral portion of many ceremonial and curative procedures.

For a fuller account of this significant phase of Cherokee tradition see: MOONEY, JAMES, *The Cherokee river cult.* Jour. Amer. Folklore **13**: 1–10. 1900; MOONEY, JAMES, and OLBRECHTS, FRANZ, *The Swimmer manuscript.* Bur. Amer. Ethnol. Bull., **99**: 22–23. 1932.

[7] MOONEY and OLBRECHTS, *The Swimmer manuscript:* 232–234, give a formula like those used in this connection and, 289–291, a formula used when "going to water" on the following morning.

[8] Cherokee medicinal practice and certain phases of Cherokee ritual depended in part on traditional spoken charms, called prayers and formulas by the Cherokee. These are memorized, must be spoken very exactly, and are the property of a semiprofessional "conjuror" class. These formulas have been written in the syllabary invented by Sequoya about 1820, and some are no longer understandable because of the archaic forms preserved in them. It is probably the ritual language of these formulas to which Hicks refers as a forgotten language in the account previously quoted.

For a thorough study of Cherokee formulas and their functions, see: MOONEY and OLBRECHTS, *The Swimmer manuscript.*

[9] Divination seems to have been an important feature in Cherokee culture; it may even once have constituted a distinct profession. The observation of the motion of suspended magical stones and, more important, of beads laid on cloth or held between thumb and forefinger was resorted to in the foretelling of death, the diagnosis of disease, the finding of lost and stolen objects, and the discovery of the identity of a witch or conjuror responsible for magically caused disease, to mention but a few of the more important uses of these divination devices. Different formalized procedures were resorted to for different purposes, and in some cases even bits of roots or twigs were employed instead of beads.

were held and no person was allowed to sleep. The proper formulas were recited by the conjuror, and further divination by the beads was tried, until it was found that the person would live. Then that person's life was believed to be secure until the next year.

Will West Long's brother, who died in 1904, was a leader at these ceremonies. Once when he examined a girl with the beads under such circumstances, he found that she would not live until the following summer. He attempted to arrange the feast to prolong her life until the next year, but her family would not cooperate by providing a feast and helping with the ceremony. Therefore it could not be held, and the girl did die the following winter.

It is probably this secondary phase of the ceremony that has survived as a curative feature in association with certain forms of diagnoses and therapy. When we consider that, among the central features of the Green Corn Festivals of the Cherokee and Creek as recorded by the earlier observers, the expiation of crime and the beginning anew of all phases of tribal life attracted much attention, the curative features of these ceremonies may also have been of great significance in aboriginal times.

One early account of the Cherokee Green Corn Festival is contained in an article dictated by Charles Hicks, second chief of the Cherokee Nation,[10] in 1818 and printed in the *Raleigh Register*:[11]

> Before eating the green corn when in the milk, the people collect in the different towns and villages at night, and when the ——— ("not understood in Mr. Hicks' original") comes, the conjuror takes some of the grains of seven ears of corn and feeds the fire, i.e. burns them. After this each family is allowed to cook and eat their roasting-ears, but not before they drink a tea of wild horehound. In like manner they observe the same custom before eating the bean when it fills in the hull.
>
> The green corn dance, so called, has been highly esteemed formerly. This is held when the corn is getting hard, and last four days, and when the national council sits—a quantity of venison being procured to supply the dance. It is said that a person was formerly chosen to speak to the people on each day in a language that is partly lost—at least there is very little of it known now. At such times as the above, a piece of land is laid off and persons appointed to occupy it—no others being allowed to use it while the feast continues.

At present, besides the curative Green Corn Feast, which is performed when required, the Cherokee have also preserved one other fragment of extreme importance. This is the Green Corn Medicine, called both sɛ·lu' djuwa'nigę'·i da·nisdi'gisgę'n'i ("corn soft, for they are eating") and sɛ·lu' it'sehi'danisdi'gi·sgę'n'i ("corn, new or green, for they are eating"). Mooney's data on the 1913 observance, already quoted, would indicate that other features had survived as a part of the family ceremony until at least that date.

This Green Corn Medicine, according to tradition, was a feature of the Green Corn Festival, and is probably represented in Hicks's account by the reference to "wild horehound." It is now no longer preceded by a purge, however, and is made and administered by the head of each household to his family; it is an individual, not a community, function, and is performed whenever the family's green corn is ready to eat. According to Mollie Sequoyah, of the Big Cove, it is intended to prevent colic caused by eating corn, the primary food resource of the Cherokee, and one which is much relished. The people have been unaccustomed to eating green corn since the previous year, and its latency for harm or benefit is believed to be strong. Children especially require prophylactic treatment to avert sickness resulting from the first seasonal use of corn. Will West Long states that it is intended to prevent the increase of stomach and intestinal worms, which otherwise would flourish on this choice food and do great damage to the person so rash as to eat of it without the medicinal preparative. None of the really conservative Indians of the Big Cove settlement would even taste green corn if they had not previously partaken of the medicine. I have seen Will look

[10] DRAKE, SAMUEL, *Book of the Indians*, ed. 8, 4: 55. Boston, 1841.

[11] Hicks's account is taken from a clipping preserved in the Bureau of American Ethnology Scrapbook 1: 354, entitled *Manner, customs, etc., of the Cherokee Indians*. Some of this account will also appear in the manuscript by Dr. F. G. Speck previously referred to, and I am indebted to him for the use of his copy of the Hicks article.

PLANTS USED IN GREEN CORN MEDICINE

Indian name	*Translation*	*English name*	*Latin name*
sɛ·luˈkwo·yaˈ[12]	"Resembling corn"	Bearded wheat grass	*Apropyron caninum* (L.) R. & S.
		Adam's-needle	*Yucca filamentosa* L.[13]
toʰti yustiˈ	"Sticks on you, like"	Spiny amaranth	*Amaranthus spinosus* L.
ɑwosɐ· ulhˤiˈ yenehiˈ	"Itself splitting or growing leaves"	Volunteer corn[14]	*Zea mays* L.
unighisˈo gohɑstˈiˈ		Wild lettuce	*Lactuca canadensis* L.
walelu' unigˈ legistiˈ	"Hummingbird, taking sap out of flower"	Jewelweed	*Impatens biflora* Walt.[15]
geluˈnaˈ		Gourd[16]	*Cucurbita lagenaria* L.
watˈskaˈ		Green amaranth	*Amaranthus retroflexus* L.
ɥgwasˈtaˈ luʸᵃdɑˈ		Ragweed	*Ambrosia trifida* L.
unistelɐʸᵉ stiˈ[17]	"Sticking on"	Wild comfrey	*Cynoglossum virginianum* L.
nistele'histiˈ	"Sticking out"	Ragweed	*Ambrosia elatior* L.

wistfully at "roasting ears" on the table of a neighbor with whom he was dining but refuse the corn because his was not ready yet and he had not taken the medicine. Under similar circumstances, Mollie decided that she could eat the corn only because it was not a variety grown by the Indians, but "white man's corn," and so did not require this preventative measure.

The medicine itself is made up, we know, of the leaves of at least four different plants and sometimes of more. Apparently the recipe varies somewhat from family to family, but I do not have sufficient data to indicate how great the differences may be. These leaves are crushed in the hands and pounded together in the mortar used to crush corn into meal and are then steeped in warm water and the solution drunk by all the members of the family. Then they are free to eat the unripe corn for the remainder of the season.

Herewith is a list of the plant ingredients used by Will West Long. The use of the first three plants is obligatory, and any one of the remainder may be used as the fourth ingredient, the others being added if available. Will West Long explains that these plants are all rampant cornfield weeds and are thus, he supposes, able to overcome the generative power of the corn imparted to the worms, except for the volunteer corn and the plant "resembling corn," which are used because they appear to be dwarfed and weakly plants of the same sort as corn. Any other cornfield weed leaves may be added to the medicine if the preparator so desires. A vermifuge, such as *Artemisia*, might be as good, the informant suggests, but is not used in this association.

The medicine as prepared by Mollie Sequoyah consists of the leaves of four plants, used in exactly the same fashion. This medicine is required to prevent colic, which would plague anyone eating the new green corn without previously taking the medicine. It is especially necessary for children. The ingredients are as follows:

[12] This name is used for both of the plants here listed, and either may be used in this medicine.

[13] According to Will West Long, the roots and leaves of the *Yucca* are also soaked in warm water and the potion drunk as a medicine for "sugar diabetes."

[14] This is merely corn that has seeded itself in a pasture or fallow field.

[15] Leaves and flowers of this plant are also used, according to Mollie Sequoyah, as one ingredient in a tea that is given to a woman in childbirth to "make the child come quickly"; it is so used because of the explosive way in which the seeds fly out of their pods.

[16] According to Mollie Sequoyah, gourd seeds are mashed and soaked in hot water, and the potion is drunk to cure inability to urinate. This is probably related to the white peoples' use of pumpkin seed for the same purpose. (See LEVINE, HAROLD D., *Folk medicine in New Hampshire.* Reprint from New England Journ. Med. **224**: 487–492: 11, 14. 1941.)

[17] This name is the general Cherokee term for bur-bearing plants, but the plant specimen was collected with the informant (as also in other cases). This plant is used as one ingredient in several compound medicines recorded by MOONEY and OLBRECHTS, *The Swimmer manuscript:* 119, 174.

. Galų'na'	Gourd
Sɛ·lu kwoyɑ'	Bearded wheat grass
Walelú unig'ł egisti'	Jewelweed
u·wɑgɑ'	Volunteer corn

There are several observances in force concerning the eating of the unripe corn. The corn is the gift of a culture heroine, whose name is sɛ·lu, the same name as that applied to corn, and the corn came from her body. These rules for treatment of the green corn and their explanation, as offered by Mollie Sequoyah, have their basis in the myth of the origin of corn, as do some of the features of the Green Corn Festival. Two versions of the story of the Corn Mother are represented later in this paper.

One must not blow on a roasted ear of green corn in order to cool it, as this would cause a thunderstorm. The Thunders are the sons and husband of Sɛlu, the Corn Mother, and would resent such disrespectful treatment of her. After the green corn has been eaten, the cobs must be kept in the house for four days, because Sɛlu's body lay outdoors on the ground for that length of time after she had been killed by her son. The all-night dancing and wakefu ness of the Green Corn Festival are the observation of the original admonition that they should stay awake all night and dance, so that the corn would grow and mature overnight.

The story of the origin of Corn, as told by Mollie Sequoyah, differs in some important features from the published accounts and from versions I have collected from other parts of the reservation.[18] Collection of further variants from existing groups of Cherokee both in North Carolina and Tennessee and in Oklahoma, and comparative study of these myths, might throw further light on Cherokee economic and ceremonial practices involving corn, besides making a contribution to the comparative study of a major myth distributed from the Creek Indians of the Southeast to the Malecite of Nova Scotia.[19]

[18] The principal versions of the Sɛlu tale are recorded in the following sources all by JAMES MOONEY: *Myths of the Cherokees.* Journ. Amer. Folklore **1**: 98. 1888; *Cherokee and Iroquois parallels.* Journ. Amer. Folklore **2**: 67. 1889; *Myths of the Cherokee.* 19th Ann. Rep. Bur. Amer. Ethnol. 242–245, 248, 431–434. 1889.

MOLLIE SEQUOYAH'S VERSION

Once a man and wife lived by themselves, with their little boy. As the boy grew older, he noticed that, while his father went hunting, his mother always went into a little storehouse (called na'wedola', an archaic term, in this story) where she obtained corn, beans, and similar vegetables for her family. When he was older, he began to wonder how she managed this, because she was always bringing food from the storehouse, but never carried anything into it.

One day he hid by the storehouse and watched her through a crack in the wall when she entered. He saw her shake herself and beat her body with her hands, and corn and beans came spilling out onto the floor from beneath her dress. Her son thought, "Why that stuff is only excrement, and she makes us believe it's food." When his mother came out of the storehouse, he killed her. In anger, he dragged her body all over the stump-filled clearing and then threw her body on the ground next to the branch (small mountain stream, the general Cherokee water supply). He chopped off her head and set it up in the window of the house, where the father would see it when he returned.

When the father returned after four days, he was very angry with his son. They went to the branch in order to bury Sɛlu's body. There they found a little boy playing in the grass. He had been born from the blood flowing fro·n Sɛlu's severed neck. They took him back, and he grew up to become the younger Thunder brother. When they returned to the cabin, they could see the blades of the first corn growing among the stumps in the clearing where her body had been dragged. The father said that they must stay awake all night, singing and dancing to keep themselves from falling asleep. They did this, and the corn was full

[19] Some of the non-Cherokee sources are as follows: SWANTON, JOHN R., *Myths and tales of the Southeastern Indian.* Bur. Amer. Ethnol. Bull. **88**: 9–17 (Creek), 230–234 (Natchez). 1929; MORGAN, LEWIS H., *League of the Iroquois* 161, 162, 199. Rochester, 1851; MECHLING, W. H., *Malecite tales.* Can. Dept. Mines, Geol. Surv. Mem. **49**: 87. Ottawa, 1914; SPECK, F. G., *Penobscot tales and religious beliefs.* Journ. Amer. Folklore **48**: 75. 1935.

grown and ripe by sunrise. In the beginning the corn could be planted in the evening and gathered ripe in the morning. Later, when the people became careless, they fell asleep one night while the corn was growing, and ever since corn has required a much longer growing season. This occurred when the father and sons were traveling west, in order to take up their station as the Thunders.

MOSES OWL'S VERSION

Moses Owl tells a somewhat different version of the story:

A couple lived in the woods with their only child. After awhile they found that he was playing with another little boy. They conspired to catch this little boy, and had their son lead him into a big trap with a door that was propped in place. The son dropped the door, imprisoning them both.

This little boy, who had been born of the blood of the game that his mother washed in the branch, was very wild and fought for his freedom, but eventually he was tamed and taught to talk and was raised as the twin brother of their son.

The tame boy was well-behaved, but his wild brother was contrary-minded and was always getting himself into trouble, and leading his companion into mischief. Finally, when they were almost grown, the mischievous brother suggested that they follow their father when he went hunting. They saw him remove a stone from the mouth of a cave, enter, and return with a deer on his back. He kept all the game that was in existence in this cave. After he had left, the boys removed the stone, but they did not know the proper charms for controlling these animals, so they all escaped. Ever since, the game has been free in the woods, instead of being the monopoly of one person, so that now everyone has the same right to the animal resources, but they have to search and work for what they get from the hunt. When the father saw the game loose in the woods, he knew what had happened, so he met the boys on the road, gave them a severe beating, and sent them on home to their mother. When they came to the house, they sneaked up and peered through a crack in the logs, because they were afraid she would give them a beating too. There they saw Sɛlu standing over a basket, shaking herself, and the corn pouring from beneath her skirts into the basket.

The wild boy said she was a witch. He ran to the door and killed Sɛlu with an arrow. His brother ran after him, angry and intending to kill him, but the wild boy threw Sɛlu's body over his shoulder and ran off. The brother pursued him until he had to drop the body in order to escape. In each of his footprints a cornplant had sprung up, and an ear of ripe corn lay where he had dropped Sɛlu. Ever since the people have planted and cared for the corn, and gathered Sɛlu's bright gift each autumn.

The sketch of the Green Corn Festival and of its background and derivatives, which is here presented, gives us an idea of the specific evolution of one element in Cherokee culture for a period of over a century. It appears that disintegrative influences were already active against this ceremonial observance and later, after the Removal (1838), the few communities of the Cherokee left in North Carolina were exposed to much stronger acculturative forces. It is interesting to note the gradual breakup of this most important ceremonial complex and, at the same time, the tenacity with which the more conservative families retained, and perhaps modified, important parts of the ritual series.

Dr. Leonard Bloom, in a recent article,[20] has attempted to discover indices of Cherokee conservatism by a correlation of the data he has collected on Indian blood percentage, clan affiliation, linguistic habit, and crafts. Without discussing his data here, we may suggest that cultural factors used in such a correlation should be not crafts, which are subject to economic motivation, but rather factors that have little or no economic survival value. Such nonmaterial traits as the use of Sequoya's syllabary in writing and the use of the Green Corn Medicine would permit a better determination of the relationship of blood to linguistic habit and other cultural traits, in terms probably of households rather than individuals. Such correlations of a number of nonmaterial traits would show degrees of conservatism, with probably only a very conservative nucleus of a few "full-blood"

[20] BLOOM, LEONARD, *A measure of conservatism.* Amer. Anthrop. 47: 630–635. 1945.

families still preserving some use of the Green Corn Medicine.

From the collection of data here presented it appears that the Cherokee in aboriginal times celebrated a major community festival when the green corn first became mature enough to eat; this festival persisted, probably in an abbreviated form as late as 1887. Portions of this ritual became separated from the obsolescent Green Corn Festival and at present are found as two separate survivals, a Green Corn Feast held for curative purposes whenever it may be required and a Green Corn Medicine, which is prepared in the separate households of the more conservative Cherokee and administered to all members of the family as a prerequisite to eating the green corn. Continued adherence to this medicine ritual indicates the strong conservatism of a certain minority of "full-blood" Cherokee households.

BOTANY.—*Mosses of El Salvador.*[1] WILLIAM C. STEERE, University of Michigan, and DOROTHY E. CHAPMAN, Office of Foreign Agricultural Relations. (Communicated by E. H. WALKER.)

The moss flora of one Central American republic, El Salvador, has remained almost completely unknown up to the present time, even though the mosses of neighboring countries have been rather extensively collected and studied. Our knowledge of the mosses of El Salvador has been confined until now to a list of 11 species included in a catalogue of the plants of the republic.[2] These 11 species are *Erythrodontium squarrosum, Fabronia flavinervis, Funaria calvescens, Orthostichidium excavatum, Pilotrichella viridis, Porotrichum cobanense, Leptodontium sulphureum, Mittenothamnium diminutivum, Papillaria nigrescens, Pireella pohli,* and *Polytrichum angustifolium,* of which only the first six are duplicated in the collections of Chapman and Kovar reported upon here. The fact that these recent larger collections have not duplicated completely all species of earlier collections demonstrates conclusively the need for further bryological explorations in El Salvador, especially since many species common elsewhere in Central America are not represented in these collections. El Salvador is so nearly a blank on the bryological map that it is necessary to report as new to its flora such common and widely distributed mosses as *Fissidens kegelianus, Trematodon longicollis, Octoblepharum albidum, Anoectangium euchloron, Bryum argenteum, Pohlia cruegeri, Philonotis glaucescens, P. gracillima,* and *Sematophyllum caespitosum.* One may still wonder why several other ubiquitous species as *Macromitrium mucronifolium, Taxithelium planum, Hyophila tortula, Rhacopilum tomentosum, Neckeropsis disticha,* and *N. undulata* have apparently still not been collected in El Salvador.

As a consequence of the lack of information concerning the mosses of El Salvador, it seems thoroughly worth while to give rather full data pertaining to the stations from which the present collections came. The following geographical and geological data on the collecting stations are based on information furnished by Dr. Anton Kovar, botanist at the Centro Agrónomo de El Salvador:

COLLECTING STATIONS OF DOROTHY E. CHAPMAN

Station A. La Ceiba, 6 km west of San Salvador, is at an altitude of 2,279 feet above sea level. It is near the upper limit of the Lower Arid Tropical Zone, where the temperature and relative humidity are comparatively high and uniform throughout the entire year, regardless of the season. The mean annual humidity is 75 percent, dropping in the dry season to ±70 percent and rising in the rainy season to 87 percent. The mean annual temperature is 74°F., with a maximum of about 90°F. and a minimum of 60°F. A year's average rainfall, based on recordings taken over a 12-year period, is ±64 inches. The soil is well-drained

[1] Contribution from the Department of Botany and the Herbarium of the University of Michigan. Received April 11, 1946.

[2] Standley, P. C., y S. Calderón. *Lista preliminar de las plantas de El Salvador* (Musci, pp. 18–19). San Salvador, 1925; ed. 2, 1941.

volcanic pumice. The mosses were collected on July 25, 1945, along the edges of the driveways and flower beds of the Experimental Station on otherwise bare soil, except for a few growing on living trees.

Station B. Santa Tecla, 12 km west of San Salvador, is at an altitude of 2,842 feet. It is near the lower limit of the Upper Arid Tropical Zone. Because of its peculiar location between the San Salvador Volcano and the Pacific coastal mountain range, this site is more humid than are other parts of the same zone, and it rains here more than in many other sections of the country. The maximum temperature averages 75–80°F., with a minimum of ±45°F. The mosses were collected on July 24, 1945, along the driveways, roads, and fields of the Centro Agrónomo de El Salvador and its immediate vicinity. The soil here consists of a top black soil layer of variable thickness, with volcanic ash beneath it, and underlying these a thin layer of talpetate (cemented and impermeable volcanic ash); then old lava flows underneath all.

Station C. The rim of the crater of the San Salvador Volcano is at an altitude of 6,132 feet. Although it is still in the Upper Arid Tropical Zone, a high degree of humidity is present in the form of dew carried by the winds from the Caribbean coast. Even during the driest season of the year, the soil and vegetation are often covered with droplets of condensed water vapor. No specific data are available as to the rainfall, relative humidity, or temperature. The soil is talpetate. The mosses were collected July 28, 1945, along the path on the crater rim among heavy herbaceous growth.

Station D. The automobile road from Santa Tecla, up the San Salvador Volcano at an altitude of 4,225 feet, is in the middle of the Upper Arid Tropical Zone. No data are available on the humidity and temperature, although both are probably lower than at Santa Tecla. However, at this particular site a mist often occurs, even at the beginning of the dry season. The soil is composed of volcanic ashes. The mosses were collected on July 28, 1945, along the steeply cut banks of the road on soil and on tree trunks.

COLLECTING STATIONS OF DR. ANTON KOVAR

The three localities, El Pilón de los Naranjos, El Jardín, and Cerro del Manzano, are in the western part of El Salvador. The west of El Salvador is in general somewhat higher than the east, and there is more of the original vegetation left. No rainfall data are available, but it can be said that the average annual rainfall is somewhat higher than in San Salvador. In San Salvador it is about 71 inches; in the region where these specimens were collected, especially at the higher altitudes, it is not below 80 inches. No temperature data are available. Judging from similar situations on the volcano of San Salvador and from personal observations, Dr. Kovar estimates that the temperature varies from 5 C. as a minimum to 25°C. as a maximum. The soils are of volcanic origin, and more or less disintegrated, especially at El Jardín and El Manzano. El Cerro del Pilón seems of more recent origin, although it is decidedly older than the volcano of San Salvador.

Cerro del Manzano (January 14, 1946). The site is at about 5,200 feet altitude. The forest shows clear signs of transition between the Upper Dry Tropical Zone and the Humid Upper Tropical Zone (cloud forest). The locality has a northern exposure.

El Jardín (December 27, 1945; January 15, 1946). At 6,500 feet altitude, this station lies wholly within the Upper Humid Tropical Zone. It is a ridge about a mile and a half long running from west to east. The locality is on the northern slope.

El Cerro del Pilón (January 16, 1946). At an altitude of 6,500 feet and south of El Jardín, which protects it against the humid northern winds from the Atlantic coast. The vegetation is decidedly xerophytic. There is a marked difference between the northern and southern slopes of the central volcanic chain. Although this chain is much nearer to the Pacific Ocean, given the prevailing northern winds the northern slopes from 5,000 feet and up receive more moisture than the southern slopes. Therefore the northern slope has a cloud forest whereas the southern slope at the same altitude has xerophytic vegetation. Yet as one goes from west to east the Humid Upper Tropical Zone is less marked. While it is very noticeable on the volcano of Santa Ana, it is somewhat less so on the volcano of San Salvador. On the volcano of San Vicente it can be noticed only on a small area near the top. San Miguel Volcano does not show it at all; probably the mountain chains in Honduras stop all the moisture.

In El Salvador the rainy season in all zones starts during the month of May and ends the latter part of October. During this period storms may be of great violence with an extremely heavy rainfall. Throughout the dry season, which lasts from November to April, there are occasional rains, usually in early November and early January.

In the following list it is interesting to note that the mosses from the Upper and Lower Arid Tropical Zones, such as *Aloinella catenula, Barbula bescherellei,* and *Globulina globifera,* are most closely related to those of dry uplands in Mexico and Guatemala, whereas the mosses from the cloud forests of the Humid Upper Tropical Zone, as *Rigodium gracile, Atrichum oerstedianum,* and *Squamidium leucotrichum,* are most closely related floristically to those of Costa Rica, the West Indies, and northern South America.

FISSIDENTACEAE

Fissidens kegelianus C. Müll. On soil, La Ceiba, *Chapman A-6;* on soil, Santa Tecla, *Chapman B-21.*

Distribution: Not uncommon at lower altitudes throughout tropical America.

Fissidens repandus Wils. ex Mitt. On soil, Santa Tecla, *Chapman B-19;* on soil, summit of Volcan San Salvador, *Chapman C-2;* on soil, road up Volcano San Salvador from Santa Tecla, *Chapman D-3;* on soil, El Jardín, December 27, 1945, *Kovar 6a.*

Distribution: Florida; Mexico; West Indies; northern South America. The type locality is near Quito, Ecuador, and not Mexico, as stated by Grout (North American Flora **15**: 176. 1943).

Fissidens vardei Thér. On rotten wood, Cerro del Manzano, *Kovar 18a.*

Distribution: Greater Antilles; Guatemala.

DITRICHACEAE

Trematodon longicollis Michx. On soil, Cerro del Manzano, *Kovar 9, 14b, 17b.*

Distribution: Cosmopolitan throughout the warmer climates of the world.

DICRANACEAE

Campylopus filifolius (Hornsch.) Mitt. El Jardín, December 27, 1945, *Kovar 3.*

Distribution: Central America; Brazil.

LEUCOBRYACEAE

Octoblepharum albidum Hedw. On bamboo roots, Montserrate, near La Ceiba, 800 meters alt., January 11, 1946, *Kovar 8.*

Distribution: Throughout tropical and subtropical climates of the whole world.

POTTIACEAE

Aloinella catenula Card. On soil, Santa Tecla, *Chapman B-7.*

Distribution: Mexico; Guatemala.

Anoectangium euchloron (Schwaegr.) Mitt. On earth, Santa Tecla, *Chapman B-12;* Cerro del Manzano, *Kovar 15.*

Distribution: Southern United States; throughout tropical and subtropical America; Asia.

Barbula bescherellei Sauerb. On soil, Santa Tecla, *Chapman B-17;* summit of Volcano San Salvador, *Chapman C-6;* road up Volcano San Salvador from Santa Tecla, *Chapman D-1.*

Distribution: Southern United States; Mexico; Guatemala.

Globulinella Steere gen. nov. (*Globulina* C. Müll., 1897, nec *Globulina* Spegaz., 1889).

Globulinella globifera (Hampe) Steere n. comb. (*Seligeria globifera* Hampe, Bot. Zeit. **28**: 49. 1870; *Trichostomum obtusifolium* Hampe, *ibid.* **28**: 49. 1870; *Globulina globifera* C. Müll., Nuov. Giorn. Bot. Ital. n.s. **4**: 39. 1897, Broth. in E. & P., Nat. Pflanzenfam. 1(3): 404. 1902; *Gyroweisia obtusifolia* Broth., *ibid.* 1(3): 389. 1902.) On soil, Santa Tecla, *Chapman B-4.*

Distribution: Mexico; Honduras.

Globulinella globifera, based on *Seligeria globifera* Hampe, is a clear-cut, unmistakable species that has been collected only a few times since its original discovery. Immediately preceding the description of *S. globifera* is the diagnosis of another proposed new species, *Trichostomum obtusifolium* Hampe, which was later transferred to *Gyroweisia* by Brotherus (1902). In reading the original descriptions of these two new species, which grew intermixed in the same type collection, one cannot help being impressed by their great similarity. Parallel phrases from the original descriptions are compared below:

Trichostomum obtusifolium	*Seligeria globifera*
"Dioicum, . . . saturate viride, gregarie.	"Dioica?, . . . gregaria, lutescente viridis, infra fuscata.
Caulis brevissimus paucifolius	Caulis brevissimus erectus, conglobatus.
Folia margine erecto concava, inferiora minora, obtuse ovata, . . . sicca involuto-conglobata, integerrima humida subcucullato-concava. . . .	Folia in globulos convoluta, ovalia, subcucullato-concava, obtusissima, integerrima . . .
Nervo lutescente apice evanido	. . . Nervo crasso lutescente apice abrupto
Cellulis basilaribus subquadratis hyalinis, caeteris dense aggregatis minimis granulosis, griseo-viridi opacis.	Cellulis basilaribus subquadratis laevioribus, pellucidis, in superiori parte folii dense aggregatis, minoribus, lucide granulatis.
Folium perichaetiale unicum convolutum.	(Folia) perichaetialia convoluta, longiora, erecta
Seta gracillima erecta (4–6‴) e flavo demum rubens	Seta gracillima 4–6 linearis flavide rubens
Theca erecta angusta, parce oblique ellipticо-cylindrica	Theca oblongo-cylindrica, annulata
Peristomium annulo hyalino circumdatum, intense rubrum, dentibus profunde bifidis, cruribus subulatis rugulosis	Peristomii dentibus brevibus subulatis, torulosis rubris.
Operculo brevi conico-rostrato Calyptra angusta fuscata"	Operculo conico-subulato Calyptra angusta, demum fuscata"

An analysis of the above comparison shows more similarities than differences. The only serious distinction between the two species seems to be in peristome structure, since it is implied that the *Seligeria* has 16 undivided teeth, an important generic character. However, Brotherus (1902, fig. 260) illustrated and described *Globulina globifera* with the teeth divided in the manner of many genera of the Pottiaceae, undoubtedly on the basis of authentic material. Hampe, himself, in comparing the two species, offers the following note concerning his *Seligeria globifera:* "Ex habitu *Trichostomi obtusifolii*, cum eo commixtum lecta; colore lutescente viridi aliena, inter Seligerias ob thecam cylindricam singularis." Most mosses differ to some extent in color between new and old growth, and this color difference is especially conspicuous in the Pottiaceae, where the new leaves are usually a bright yellowish or bluish green and the old leaves a dark green, red, or brown to black. It is probable that the specimen seen by Hampe contained plants of several seasons, showing the color differences he stresses. Furthermore, several Mexican specimens named *Gyroweisia obtusifolia* by Cardot and Thériot are clearly *Globulina globifera*. For additional evidence of the close relationship of these two species, the opinion of Andrews[3] may be cited. In speaking of the genus *Gyroweisia*, he says: "*G. obtusifolia* (Hpe.) Broth. from Mexico is a plant in many ways suggesting relationship with the Mexican species of the genus *Globulina* C. M." Another similar opinion is that of Müller,[4] who says: "Das niedliche Pflänzchen, welches diesen Typus begründet, nämlich Seligeria globifera Hpe., welche Strebel in den 60er Jahren an Kalkfelsen bei Veracruz in Mexico sammelte, hat ganz die Tracht eines kleinen Trichostomum, etwa des T. obtusifolium Hpe., mit welchem es zusammen wächst."

Consequently, there seems to be no valid excuse for keeping separate Hampe's two species based on one type collection, and it is therefore proposed to put the less well known *Trichostomum obtusifolium* into the synonymy of *Seligeria globifera*, although the strictest interpretation of priority of place might indicate the opposite procedure.

Since *Globulina boliviana* has been transferred to *Barbula* by Hilpert,[5] after a careful study, the only other species which belongs here is *Globulinella peruviana* (R. S. Williams) Steere n. comb. (*Globulina peruviana* R. S. Williams, Bull. Torrey Bot. Club **43**: 325. *pl. 17, f. 8–15*. 1916).

Rhamphidium macrostegium (Sull.) Mitt. On rock, Cerro del Pilón, *Kovar 28a*.

Distribution: West Indies; Mexico, Costa Rica; South America.

[3] Andrews, A. L. *The status of* Gyroweisia *in North America*. Bryol. **25**: 97–100. 1922.

[4] Müller, C. *Genera muscorum frondosorum*, vi+474 pp. Leipzig, 1901.

[5] Hilpert, F. *Studien zur Systematik der Trichostomaceen*. Bot. Centralbl. **50(2)**: 585–706. 1933.

Tortula caroliniana Andrews. On tree, summit of Volcano San Salvador, around crater, *Chapman C-4.*

Distribution: Southern United States; Mexico; Guatemala, Costa Rica.

FUNARIACEAE

Funaria calvescens Schwaegr. On soil, La Ceiba, *Chapman A-2;* on soil, Santa Tecla, *Chapman B-1;* on soil, road up Volcano San Salvador from Santa Tecla, *Chapman D-6;* Cerro del Manzano, *Kovar 14, 17.*

Distribution: El Salvador; throughout all tropical and subtropical regions of the world.

SPLACHNACEAE

Splachnobryum bernoullii C. Müll. On soil, La Ceiba, *Chapman A-1;* on soil, Santa Tecla, *Chapman B-5.*

Distribution: Guatemala, Honduras; Mexico.

BRYACEAE

Anomobryum semiovatum (Brid.) Jaeg. On soil, Santa Tecla, *Chapman B-6.*

Distribution: Costa Rica; South America.

Brachymenium capillare Schimp. On soil, summit of Volcano San Salvador, *Chapman C-5* (a juvenile state).

Distribution: Mexico; Costa Rica.

Bryum andicola Hook. On roots, summit of Volcano San Salvador, around crater, *Chapman C-3;* on rotten wood, El Jardín, December 27, 1945, *Kovar 5a,* on humus, *Kovar 6.*

Distribution: Mexico; Honduras, Costa Rica; West Indies; South America.

Bryum argenteum Hedw. On soil, La Ceiba, *Chapman A-4;* on soil, Santa Tecla, *Chapman B-2;* on soil, summit of Volcano San Salvador, around crater, *Chapman C-1* (var. *lanatum*); on soil, road up Volcano San Salvador from Santa Tecla, *Chapman D-5;* Cerro del Manzano, *Kovar 9a, 14a, 17a.*

Distribution: A weedy species truly cosmopolitan in all parts of the world.

Epipterygium immarginatum Mitt. On soil, Santa Tecla, *Chapman B-3.*

Distribution: Guatemala.

Pohlia Cruegeri (Hampe) Andrews. On earth, Santa Tecla, *Chapman B-8.*

Distribution: Southern United States; widespread in tropical America.

Pohlia papillosa (C. Müll.) Steere n. comb. (*Bryum papillosum* C. Müll., Syn. 1: 326. 1849.) On soil, Cerro del Pilón, *Kovar 28.*

Distribution: West Indies; Costa Rica; northern South America.

BARTRAMIACEAE

Philonotis glaucescens (Hornsch.) Paris. On soil, Santa Tecla, *Chapman B-16.*

Distribution: Southern United States; widespread in tropical America.

Philonotis gracillima Aongstr. On soil, La Ceiba, *Chapman A-3;* on earth, Santa Tecla, *Chapman B-15.*

Distribution: Widespread in tropical and subtropical America, usually at lower altitudes.

Philonotis sphaericarpa (Hedw.) Brid. On soil, summit of Volcano San Salvador, around crater, *Chapman C-7.*

Distribution: Florida; West Indies; Mexico; Central and South America; usually at higher altitudes.

PRIONODONTACEAE

Prionodon densus (Hedw.) C. Müll. On tree, El Jardín, December 27, 1945, *Kovar 4a;* January 15, 1946, *Kovar 20;* on tree, Cerro del Pilón, *Kovar 31.*

Distribution: West Indies; Mexico; Central and South America.

PTEROBRYACEAE

Orthostichidium pentagonum (Hampe) C. Müll. On tree, Cerro del Pilón, *Kovar 30.*

Distribution: Mexico; British Honduras, Costa Rica; South America. The report of *Orthostichidium excavatum* from Cerro del Guayabal, El Salvador, by Standley and Calderón should undoubtedly be referred here.

METEORIACEAE

Meteoriopsis patula (Hedw.) Broth. On branch, Cerro del Manzano, *Kovar 11;* epiphytic, El Jardín, January 15, 1946, *Kovar 23.*

Distribution: Very widespread in tropical and subtropical America.

Pilotrichella flexilis (Hedw.) Jaeg. Epiphytic, El Jardín, January 15, 1946, *Kovar 19;* epiphytic, Cerro del Pilón, *Kovar 29.*

Distribution: West Indies; Mexico; Central and South America.

Pilotrichella rigida (C. Müll.) Besch. Epiphytic, Cerro del Pilón, *Kovar 35.*

Distribution: Mexico; Guatemala, Costa Rica; Honduras. The report of *Pilotrichella viridis* from Ahuachapán, El Salvador, by Standley and Calderón, almost certainly refers to this species.

Squamidium leucotrichum (Tayl.) Broth. On twig of cypress, Cerro del Manzano, *Kovar 11a;* on small branch, El Jardín, January 15, 1946, *Kovar 22.*

Distribution: West Indies; Costa Rica; South America.

PHYLLOGONIACEAE

Phyllogonium fulgens (Hedw.) Brid. On tree, El Jardín, December 27, 1945, *Kovar 4.*

Distribution: West Indies; Central and South America.

NECKERACEAE

Homalia glabella (Hedw.) Mitt. On rock, Cerro del Pilón, *Kovar 33.*

Distribution: West Indies; Mexico; British Honduras, Honduras, Costa Rica; northern South America.

Neckera urnigera C. Müll. On tree, Cerro del Pilón, *Kovar 30a.*

Distribution: Mexico.

Porotrichum cobanense C. Müll. On rock, El Jardín, December 27, 1945, *Kovar 2a;* on tree, Cerro del Manzano, *Kovar 10, 18b;* on rock, Cerro del Pilón, *Kovar 26;* epiphytic, *Kovar 37;* on rock, *Kovar 38.*

Distribution: El Salvador, Guatemala, British Honduras, Costa Rica, Panama.

LEMBOPHYLLACEAE

Rigodium gracile Ren. & Card. Epiphytic, Cerro del Pilón, *Kovar 34a.*

Distribution: Costa Rica.

HOOKERIACEAE

Lepidopilum haplociliatum (C. Müll.) Paris. On twig, El Jardín, December 27, 1945, *Kovar 1.*

Distribution: Guatemala, Costa Rica.

FABRONIACEAE

Fabronia flavinervis C. Müll. On wood, La Ceiba, *Chapman A-5;* on tree, Santa Tecla, *Chapman B-10;* on roadside tree, road up Volcano San Salvador from Santa Tecla, *Chapman D-7.*

Distribution: El Salvador, Guatemala, Honduras, Costa Rica; Mexico.

BRACHYTHECIACEAE

Brachythecium stereopoma Spruce. On soil, summit of Volcano San Salvador, around crater, *Chapman C-9.*

Distribution: West Indies; Costa Rica; South America.

ENTODONTACEAE

Erythrodontium densum (Hook.) Paris. On wood, Santa Tecla, *Chapman B-11.*

Distribution: Mexico; Costa Rica; South America.

Erythrodontium squarrosum (C. Müll.) Paris. On tree, Santa Tecla, *Chapman B-9;* on tree, road up Volcano San Salvador from Santa Tecla, *Chapman D-2.*

Distribution: El Salvador, Costa Rica; South America.

PLAGIOTHECIACEAE

Stereophyllum mexicanum R. S. Williams. On wood, Santa Tecla, *Chapman B-14.*

Distribution: Mexico.

SEMATOPHYLLACEAE

Sematophyllum caespitosum (Hedw.) Mitt. On wood, Santa Tecla, *Chapman B-13;* on twig, El Jardín, December 27, 1945, *Kovar 2.*

Distribution: Widely distributed through the tropics and subtropics of the whole world.

HYPNACEAE

Microthamnium lehmanii Besch. On dead wood, Cerro del Manzano, *Kovar 12, 18;* epiphytic, Cerro del Pilón, *Kovar 29.*

Distribution: Costa Rica.

Microthamnium reptans (Hedw.) Mitt. On rotten wood, El Jardín, December 27, 1945, *Kovar 5;* epiphytic, Cerro del Pilón, *Kovar 34.*

Distribution: Very widespread in tropical America.

POLYTRICHACEAE

Atrichum oerstedianum (C. Müll.) Mitt. On soil, El Jardín, December 27, 1945, *Kovar 7;* on soil, Cerro del Pilón, *Kovar 36.*

Distribution: Costa Rica, Honduras.

Pogonatum liebmannianum Schimp. On soil, Cerro del Manzano, *Kovar 13*.

Distribution: Mexico; Costa Rica.

Polytrichum juniperinum Hedw. On soil, Cerro del Pilón, *Kovar 25*.

Distribution: In temperate and cold climates of the whole world.

BOTANY.—*A new species of* Sphaceloma *causing scab of plantain* (Plantago).[1]

ANNA E. JENKINS, Bureau of Plant Industry, Soils, and Agricultural Engineering, and A. A. BITANCOURT, Instituto Biologico, São Paulo, Brazil.

In 1938 a specimen of *Sphaceloma* on plantain (*Plantago formosana*), which he had collected at Taihoku, Formosa, on May 16, 1928, was sent to the senior writer by K. Sawada of the Taihoku Imperial University. The specimen showed abundant leaf and peduncle spotting (Fig. 1, I). In 1939, the writers found the same type of spotting on plantain (*P. rugelii*) in Washington, D. C., near the entrance to the Smithsonian Institution Building and on the grounds of the Washington Monument. Subsequently they collected specimens of the same fungus in New Jersey, Michigan, Indiana, and Illinois. The record of the fungus in Indiana previously made (*5*) is based on the collection in Indiana, here illustrated (Fig. 1, A–H and J–M).

These several collections, together with others now available, reveal that this fungus is widespread in eastern United States. It was extremely abundant in the District of Columbia area during the summer and autumn of 1940, when it was isolated in pure culture (Fig. 1, N). Mature inflorescences of the *Plantago* showed that it was *P. rugelii*. Unfortunately, because of the lack of mature inflorescences, it has not been possible among some of the other specimens available to determine whether the host species is *P. rugelii* or *P. major*. Two early specimens examined, hitherto unidentified, are from Still Pond, Md., October 10, 1891, E. F. Smith, and Arlington, Conn., October 27, 1900, G. P. Clinton. In the former case the leaves were collected because of the presence of *Erysiphe cichoracearum* DC. on them, but the *Sphaceloma* (*6*) spot also is abundant. The label of this specimen does not bear the collector's name. The handwriting, however, may be distinguished as that of Dr. Erwin F. Smith, who was studying peach yellows at Still Pond at this time. His bulletin on the subject (*10*) refers to a visit to Still Pond as late as July 24, 1891 (*loc. cit.*, foot note p. 43); that of October 10 doubtless was too late for similar record.

Since this pathological condition and the pathogen have not been accorded recognition as taxonomic entities, the disease is here termed "scab of plantain," and the fungus is proposed as a new species.

Sphaceloma plantaginis, sp. nov.

Spots on leaves and scapes, including bracts and calyx, few to numerous, scattered, although may be more abundant on lower part of leaves and peduncles; on leaves diaphyllous, usually more prominent above, circular to subcircular, minute to 1.5 mm in diameter, coalescent, usually in small groups, often with raised margins, either hyperplastic or necrotic, or hyperplastic in outer area and necrotic in central pale area, necrotic tissue collapsed, often reduced to the imperfectly formed upper and lower epidermis, papery and translucent except for veins, which remain after the other tissue has become lacerated and dropped away; on scapes circular to elliptical, occasionally elongate, on peduncle often depressed, minute 1–1.5, rarely 2 mm in diameter, at first water-soaked in appearance, occasionally "neutral red"[2] usually (on dry specimen) "deep vinaceous" to "russet vinaceous," sometimes "pale grayish vinaceous,"central area or occasionally entire spot paling to dirty white or white; hyphae subcuticular, becoming intraepidermal, disrupting the epidermis, forming a more or less extensive superficial hyaline stroma up to 15μ thick, this sometimes extending below the epidermis, as a loose prosenchyma, or forming a naked hyaline stroma projecting hori-

[1] Received March 22, 1946.

[2] Colors in quotation marks are based on Ridgway (*9*).

zontally from the margin of the perforation, up to 50μ thick; acervuli absent, sparse or abundant, amphigenous, more often epiphyllous, in one case as many as 40 dotting the necrotic center of a leaf spot 0.5 mm in diameter, viewed from above, circular to elliptical, 15μ to 65μ in diameter, may be confluent, hyaline to brown; conidiophores closely grouped, pointed, 8–10 by 2.6–3.3μ, hyaline to colored, in culture as many as 16μ long, produced at right angles to the hyphae, bearing apical and lateral conidia as illustrated by Doidge and Butler (*3*) for what was later identified (*4*) as *Sphaceloma* on citrus; conidia sessile on the hyphae or stroma, as well as pleurogenous on conidiophores, spherical to elliptical or oblong, often bigultulate, usually 5–10 by 2–4μ, swelling and becoming 2-celled and colored.

Maculis foliicolis sparsis, minutis usque 1.5 mm latis, amphigenis, frequenter margine elevata cinctis, parte centrali papyracea hyalina, primo castaneo-rubra et deinceps in medio albicante. Maculis in inflorescentiis, in pedunculis et petiolis, magis elongatis, 1–1.5 mm, raro 2 mm latis, in medio depressis.

Acervulis amphigenis, communiter tantum epiphyllis, punctiformibus, nigris, 15–65μ latis, distinctis vel saepe confluentibus. Conidiophoris arcte connatis, acutis, 8–10 $\times$ 2.6–3.3μ, hyalinis vel obscuris, conidiis sphaericis, ellipticis vel oblongis, frequenter 2—guttulatis, hyalinis, 5–10 $\times$ 2.5μ.[3]

Hosts, distribution, and specimens examined:[4]

[3] We are indebted to D. P. Pickel for the diagnosis in Latin.

[4] The specimens cited have been deposited in the Mycological Collections of the Bureau of Plant Industry, Soils, and Agricultural Engineering (USM), Plant Industry Station, Beltsville, Md., and in the herbarium of the Secção Fitopatologia, Instituto Biologico (IB), São Paulo, Brazil. Of the few undivided specimens, those represented only in the Mycological Collections are indicated by a dagger (†); those only in the Instituto Biologico, by a double dagger (‡). Specimens marked with an asterisk (*) have been selected for numbers in the Jenkins-Bitancourt "Myriangiales selecti exsiccati" (MSE), fascicles 5 and 6, in process of issue.

Grateful acknowledgement is made to those who contributed or assisted in collecting specimens, and also to the Grain and Seed Division, Agriculture Marketing Service, United States Department of Agriculture, and to Dr. S. F. Blake for identifications of *Plantago maior* and *P. rugelii*.

ON PLANTAGO SP.

CONNECTICUT: Arlington, Oct. 27, 1900, G. P. Clinton† (Ex. Herb. Dept. Plant Pathology and Botany, Conn. Agr. Exp. Station). MARYLAND: Olney, Sept. 28, 1941, A. E. Jenkins†; vic. Rockville, Aug. 31, 1945, A. E. Jenkins†; Still Pond, Oct. 10, 1891, E. F. Smith†. MASSACHUSETTS: Cambridge, June 1940, L. Grosinsky†; Marshfield, Aug. 8, 1942, O. C. Boyd*; Waltham, June 26, 1941, J. G. Horsfall and A. E. Jenkins. MICHIGAN: East Lansing, Sept. 24, 1939, A. A. Bitancourt and A. E. Jenkins. NEW JERSEY: Bloomfield, Sept. 15, 1939, A. A. Bitancourt and A. E. Jenkins‡; Highland Park, Sept. 20, 1940, P. P. Pirone*. NEW YORK: Walton, July 7, 1942, A. E. Jenkins†. PENNSYLVANIA: Herndon, July 14, 1940, A. E. Jenkins. VERMONT: Plymouth near birthplace of Calvin Coolidge, June 27, 1941, A. E. Jenkins. VIRGINIA: Williamsburg, May 25, 1940, A. E. Jenkins. WEST VIRGINIA: vic. Elkins, Aug. 15, 1944, R. E. Atkinson and P. R. Miller.

ON PLANTAGO FORMOSANA Masam.

FORMOSA, Taihoku, May 16, 1928, K. Sawada. Taihoku is the type locality for *P. formosana*, which was described in 1932 (cf. *8*). From the diagnosis and from Sawada's specimen, it would appear that this species of *Plantago* is more or less closely related to *P. major*. The spotting on the Formosan gathering is minute on leaves; otherwise it resembles infected growth of *P. major* and *P. rugelii* from this country. It seems reasonable for the present at least to regard the *Sphaceloma* on *P. formosana* as *S. plantaginis* as is here done. *P. major* is found in Formosa, where several varieties of it have been described (cf. *7*). It is possible that sooner or later the *Sphaceloma* will be found there on this species, on one or more of its varieties and on still other species of the genus.

ON PLANTAGO MAJOR L.

MASSACHUSETTS: Grafton, Sept. 14, 1940, O. C. Boyd*. Boyd (*2*) states that this *Sphaceloma* disease was observed in several parts of Massachusetts in 1941. QUEBEC, Rimouski, Sept. 20, 1939, J. Bt. Caron, Comm. E. Le Page (host as given on specimen is *P. major*).

FIG. 1. *Sphaceloma plantaginis*. A–H, on *Plantago rugelii*, vic. Attica, Ind., Sept. 26, 1939: A–C, infection originating on upper leaf surface, A, also showing two infected peduncles; D and E, infection originating on lower leaf surface, E, on vein (A–E, ×1); F, leaf spots (×12); G, *a*, infection on sepals (×6); H, on stem, acervuli visible as dark punctate masses (×12). I, on *P. formosana*, Taihoku, Formosa, *a*, spotting on peduncle (×1); *b*, on leaf (×3¼). J–M, from specimen from Indiana, J, vertical section through upper part of a hyperplastic leaf lesion, *a*, acervulus, *b*, hyperplastic leaf tissue, between *a* and *b*, lacerated leaf tissue interspersed with loose prosenchyma (×500); M, petiole canker dotted with acervuli (*a*) (×20); K, *b*, acervulus from M, rupturing epidermis (a); L, *a*, another acervulus from M, rupturing epidermis (*b*). (K and L, ×500.) N, old culture on Thaxter potato agar, (×1). Photographs by M. L. F. Foubert (A–H, J and N), R. L. Taylor (I), and Bitancourt (K–M).

ON PLANTAGO RUGELII Dene.

DISTRICT OF COLUMBIA: *NW Section:* Vic. Bureau of Standards, June 11, 1944, J. A. Stevenson†; park at Connecticut Ave. and Kalorama Road, Aug. 31, 1940*, and Sept. 12, 1940*, A. E. Jenkins; California Street west of Connecticut Ave. July 23, 1941, A. E. Jenkins*; *SW Section:* Grounds, Washington Monument, east of Monument, June 30, 1940*, and Oct. 24, 1940*; northwest of Monument, Aug. 27, 1939*; west of monument, Sept. 13 and 14, 1940*, and Oct. 24, 1940*, A. E. Jenkins; The Mall, 14th Street between Madison Drive and Constitution Ave., July 14 and 16, 1941, A. E. Jenkins*; Madison Drive, between 12th and 13th Streets, June 5, 1940*; July 3, 1940;* Sept. 10, 1940* and July 21, 1941*, A. E. Jenkins; May 31, 1942, M. Bensaude and A. E. Jenkins†; grounds, U. S. National Museum, west of Museum, July 28, 1941*; July 10, 1942*; southwest of Museum, June 3, 1940*, A. E. Jenkins; near entrance to Smithsonian Institution Building, Aug. 8, 1939, A. A. Bitancourt and A. E. Jenkins‡; Aug. 28, 1940, A. E. Jenkins*; east of Freer Art Galley, May 31, 1940, L. Grodsinsky and A. E. Jenkins*; June 30, 1940*; also Aug. 30, 1940*, and June 23, 1941*; A. E. Jenkins; vic. Freer Art Gallery, July 10, 1942, A. E. Jenkins*; 12th Street near Maryland Ave., Aug. 28, 1940*, and Aug. 28, 1941*, A. E. Jenkins; *SE section:* Vic. Library of Congress Annex, Oct. 25, 1941, A. E. Jenkins and A. Marchant. ILLINOIS: Urbana, University of Illinois campus, Sept. 27, 1939, E. E. Honey, A. A. Bitancourt, and A. E. Jenkins. INDIANA: Attica, several miles west, Sept. 26, 1939, E. E. Honey, A. A. Bitancourt, and A. E. Jenkins* (type, USM 74085; IB 3413; MSE 253). MARYLAND: Beltsville, grounds, Plant Industry Station, Oct. 4 and 18, 1940, A. E. Jenkins*; Thurmont, Hi-Catoctoon Camp, June 9, 1940, E. O. Regis, R. Davidson, and A. E. Jenkins*. NEW YORK: Fishkill, Sept. 18, 1939* and July 4, 1945, A. E. Jenkins; Ithaca, near Cornell Univ. campus, July 16, 1940, F. M. Barrus and A. E. Jenkins*; on campus, Sept. 4, 1942, A. E. Jenkins*; State Street., Sept. 4, 1942, A. E. Jenkins; New York City, New York Botanical Garden, June 23, 1942; vic. New York Botanical Garden, July 3, 1945, A. E. Jenkins. OHIO: Wooster, Sept. 1940, P. E. Tilford*. PENNSYLVANIA: Walnut Shade, July 14, 1940, M. L. Bombard and A. E. Jenkins* (leaves and scapes from this specimen photographed in Dept. Plant Pathology, Cornell Univ., July 15, 1940). VIRGINIA: Chatham, Nov. 1, 1940, F. A. Wolf*. WISCONSIN: Madison, Aug. 1942, A. S. Costa*.

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ENTOMOLOGY.—*The Philippine mosquitoes of the genus* Aedes, *subgenus* Aedes.[1]

JEAN LAFFOON, PhM1c, U.S.N.R., U. S. Naval Medical Research Unit No. 2.
(Communicated by ALAN STONE.)

The majority of the specimens of mosquitoes used in this study were collected in the Philippines by members of a field unit of U. S. Naval Medical Research Uint No. 2. Additional material studied included specimens in the collections of the U. S. National Museum, Academy of Natural Sciences of Philadelphia, California Academy of Sciences, Philippine Bureau of Health, and the Museum of Comparative Zoology. I am indebted to Dr. Alan Stone, Dr. H. R. Roberts, Dr. E. S. Ross, F. E. Baisas, and Dr. Joseph Bequaert, respectively, for the opportunity to see these specimens. Dr. K. L. Knight, Dr. R. M. Bohart, and Dr. Stone offered numerous helpful criticisms and suggestions concerning this work. Dr. Ross kindly furnished the larval figures of *hamistylus* and *campylostylus*. Space in which to carry out this study was provided by the Division of Insects, U. S. National Museum.

About 50 species are now recognized in the subgenus *Aedes*. Of these the great majority are Oriental and Australasian. Thirteen species are known from the Philippines, six of them being described in this paper as new.

The terminology of the female genitalia as used here is principally that employed by Crampton (1942). The term "cowl" is avoided since it has been used to denote different structures by various authors. The term "atrial plate" has been used by several writers. However, for the purpose of this paper, the term "postatrial plate" (or plates) is applied to those structures forming the posterior wall of the atrium, and the term "preatrial plate" (or plates) for those forming the anterior wall. The preatrial plates, along with the preatrial sclerite, normally are folded over the postatrial plates. To obtain a good view of the important structures, it is necessary to mount the specimen with the preatrial sclerite and plates extended anteriorly, as shown in the figures. Careful manipulation with fine dissecting needles is necessary to accomplish this.

The terminology used for the larval head hairs is that adopted by Marshall (1938).

The only Oriental and Australasian species for which neither male nor female genitalia have been described or figured are *carmenti* Edwards (Australasian), *similis* (Theobald) (Australasian), *incertus* Edwards (Malay Peninsula, Borneo, and New Guinea), and *perditus* (Leicester) (Malay Peninsula). These species can be separated from all known Philippine species by the following characters: *incertus* (according to Edwards, 1924) has complete, conspicuous, white basal abdominal bands in both sexes; *perditus* (according to Leicester, 1908) has two long, sharp spines near the base of the larger claw of the male foreleg; *similis* (according to Theobald, 1910) has all claws of the female simple; and *carmenti* (according to Edwards, 1924) has dark upper sternopleural scales.

Because of the extreme external similarity of the Philippine species in many respects, the individual descriptions would be very repetitious if all the characters common to all species were noted in each description. However, some of these characters may well be valuable in distinguishing species as yet unknown. Therefore, a description of characters common to the known Philippine species follows:

Male antenna plumose, torus with a few tiny dark scales ventrally or medially or bare. Clypeus bare, dark brown. Palpus short in both sexes. Proboscis and labellum brown. Head scales mostly flat dark brown, with a pale lateral patch and some brown, upright, forked scales on nape. Scutal and scutellar scales narrow and curved. *Ppn* with about four bristles along the posterior margin. Patches of broad white scales on the propleuron, upper and posterior median portions of the sternopleuron, and on the upper part of the mesepimeron. Forecoxa with a small dorsal patch of flat pale scales, a larger patch of brown scales below these, and a small patch of flat pale

[1] Received May 2, 1946.

scales ventrally on the anterior aspect; mid and hind coxae each with a patch of pale scales. Femora pale below to or nearly to apex, remainder of legs entirely dark. Wings dark-scaled. Tergite I always with white scales along lateral border.

KEY TO MALES

1. Abdominal tergites II–VIII always with some white or yellowish basolateral markings, sometimes produced onto dorsum, sometimes reduced to a few scales; hind claws always simple 2
   Abdominal tergites II–VIII entirely brown; mesepimeron never with more than 3 or 4 hairs behind scale patch; about 5–10 small upright forked scales on nape on each side of midline; about 12 verticillate bristles on most antennal segments 11
2. Anterior median portion of sternopleuron with about 15 hairs; sternites almost entirely white 3
   Anterior median portion of sternopleuron without hairs, or with only 1 or 2 (rarely up to about 8 in *umbrosus*) 5
3. Ninth tergite with a very large median Y-shaped process about as long as basistyle, each branch with an additional hairy branch on its ventral surface ..... *macrodixoa* Dyar and Shannon
   Ninth tergite without such a process 4
4. Basistyle with a group of about 8 stout spines on the inner ventral margin; paraproct short; two very long processes arising near apex of basistyle, one with about 3 stout spines near tip ..... *uncus* (Theobald)
   Inner ventral margin of basistyle without a group of stout spines; paraproct longer than basistyle; a broad process near apex of basistyle with a row of about 4 heavy spines apically ..... *nubicolus*, n. sp.
5. Meteusternum with numerous fine hairs; fore and mid legs with claws unequal, the larger ones uniserrate, the smaller simple; basistyle with a group of about 8 stout spines on the inner ventral margin near the base 6
   Meteusternum without hairs; basistyle without such a group of spines 8
6. Apicodorsal prolongation of basistyle very wide with its two distal forks about equal in length; only 2 other long apical processes, sometimes a more ventral short spine also visible (Fig. 9); Balabac ..... *adustus*, n. sp.
   Apicordorsal prolongation of basistyle otherwise; three other long apical or subapical processes present 7
7. Apicodorsal prolongation of basistyle very wide (Fig. 7); Mindanao, Basilan, and Leyte ..... *johnsoni*, n. sp.
   Apicordorsal prolongation of basistyle much narrower (Fig. 8); Luzón and Mindoro ..... *margarsen* Dyar and Shannon
8. At least 10 hairs on posterior and ventral parts of mesepimeron, usually more numerous 9
   Mesepimeron with a number of bristles along upper margin but with no hairs ventral to scale patch and never more than 3 or 4 behind it 10
9. About 12 verticillate bristles on most antennal segments; upper sternopleural scale patch usually extending to anterior median angle of sclerite; claws of fore and midlegs equal, toothed; abdominal sternites II–VII with a wide basal white band, covering at least basal two-thirds of each segment; dististyle simple ..... *panayensis* Ludlow
   About 20 verticillate bristles on most antennal segments; upper sternopleural scale patch never extending to anterior median angle of sclerite; claws of foreleg unequal, both toothed; claws of midleg equal, both simple; sternites entirely brown, or with a few white scales on basal one-third; dististyle forked ..... *umbrosus* Brug
10. Scutal integument reddish brown; smaller claws of fore and midlegs each with a small tooth; sternites II–VII with about basal two-thirds of each segment white; basistyle with a large patch of flat white scales laterally; paraproct forked beyond middle ..... *campylostylus*, n. sp.
    Scutal integument blackish brown; smaller claws of fore and midlegs simple; sternites II–VII entirely brown; basistyle with flat brown scales only; paraproct simple ..... *nigrotarsis* (Ludlow)
11. Larger claw of midleg simple, smaller claws of fore and midlegs each with a small tooth (genitalia as in Fig. 2) ..... *hamistylus*, n. sp.
    Larger claw of midleg with a prominent tooth, smaller claws of fore and midlegs simple 12
12. Hind claws each with a prominent tooth (genitalia as in Fig. 3) ..... *robertsi*, n. sp.
    Hind claws simple (genitalia as in Fig. 6) ..... *dux* Dyar and Shannon

KEY TO FEMALES

1. Abdominal tergites II–VIII always with some white or yellowish basolateral markings, sometimes produced onto dorsum, sometimes reduced to a few scales; hind claws always simple 2
   Abdominal tergites II–VIII entirely brown; about 5–10 small upright forked scales on nape on each side of midline; mesepimeron never with more than 3 or 4 hairs behind scale patch 8
2. Anterior median portion of sternopleuron with about 15 hairs; sternites almost entirely white 3
   Anterior median portion of sternopleuron bare of hairs or with only 1 or 2 (rarely up to about 8 in *umbrosus*) 4
3. Atrial hairs confined to median area; preatrial

plates not united ..... *macrodizoa* Dyar and Shannon

Atrial hairs not confined to median area; preatrial plates united for greater part of their length ..... *uncus* (Theobald)

4. Meteusternum with numerous fine hairs ..... *adustus*, n. sp.
johnsoni, n. sp.
margarsen Dyar and Shannon

Meteusternum without hairs 5

5. At least 10 hairs on posterior and ventral parts of mesepimeron, usually more numerous 6

Mesepimeron with a number of bristles along the upper margin but no hairs ventral to the scale patch and never more than 3 or 4 behind it 7

6. Upper sternopleural scale patch usually extending to anterior median angle of sclerite; sternites II–VII with a wide basal white band covering at least basal half of segments; postatrial sclerite not trilobed ..... *panayensis* Ludlow

Upper sternopleural scale patch never extending to the anterior median angle of sclerite; abdominal sternites entirely dark brown or with some white scales on basal one-third; postatrial sclerite trilobed ..... *umbrosus* Brug

7. Scutal integument reddish brown; sternites II–VII with about basal two-thirds white; no large round dark preatrial plate ..... *campylostylus*, n. sp.

Scutal integument blackish brown; sternites II–VII entirely brown; a large round heavily pigmented preatrial plate in addition to the paired preatrial plates ..... *nigrotarsis* (Ludlow)

8. Hind claws simple; a pair of hairy processes anterior to the spermathecal eminence ..... *dux* Dyar and Shannon

Hind claws toothed; no paired hairy processes anterior to the spermathecal eminence ... 9

9. Postatrial area with areas of densest sclerotization as shown in Fig. 16 ..... *hamistylus*, n. sp.

Postatrial area with areas of densest sclerotization as shown in Fig. 15 .. *robertsi*, n. sp.

KEY TO KNOWN LARVAE

1. Comb scales with a complete apical fringe, no prominent terminal spine; pentad hair 2 of abdominal segment VIII with 4–5 branches; mentum with 11–13 teeth on each side ... *umbrosus* Brug

Comb scales with a distinct terminal spine; pentad hair 2 of abdominal segment VIII with 1–3 branches 2

2. Mentum with 8–11 teeth on each side; anal gills 1.0–1.5 times as long as anal plate ... *dux* Dyar and Shannon

Mentum with 13 or more teeth on each side; anal gills at least 1.7 times as long as anal plate 3

3. Head hair 5 with at least 5 branches (very rarely 4); head hair 6 with at least 4 branches 4

Head hairs 5 and 6 with not more than 3 branches each 5

4. Mentum with 18–20 teeth on each side; prothoracic hair 2 single; prothoracic hair 8 double ..... *campylostylus*, n. sp.

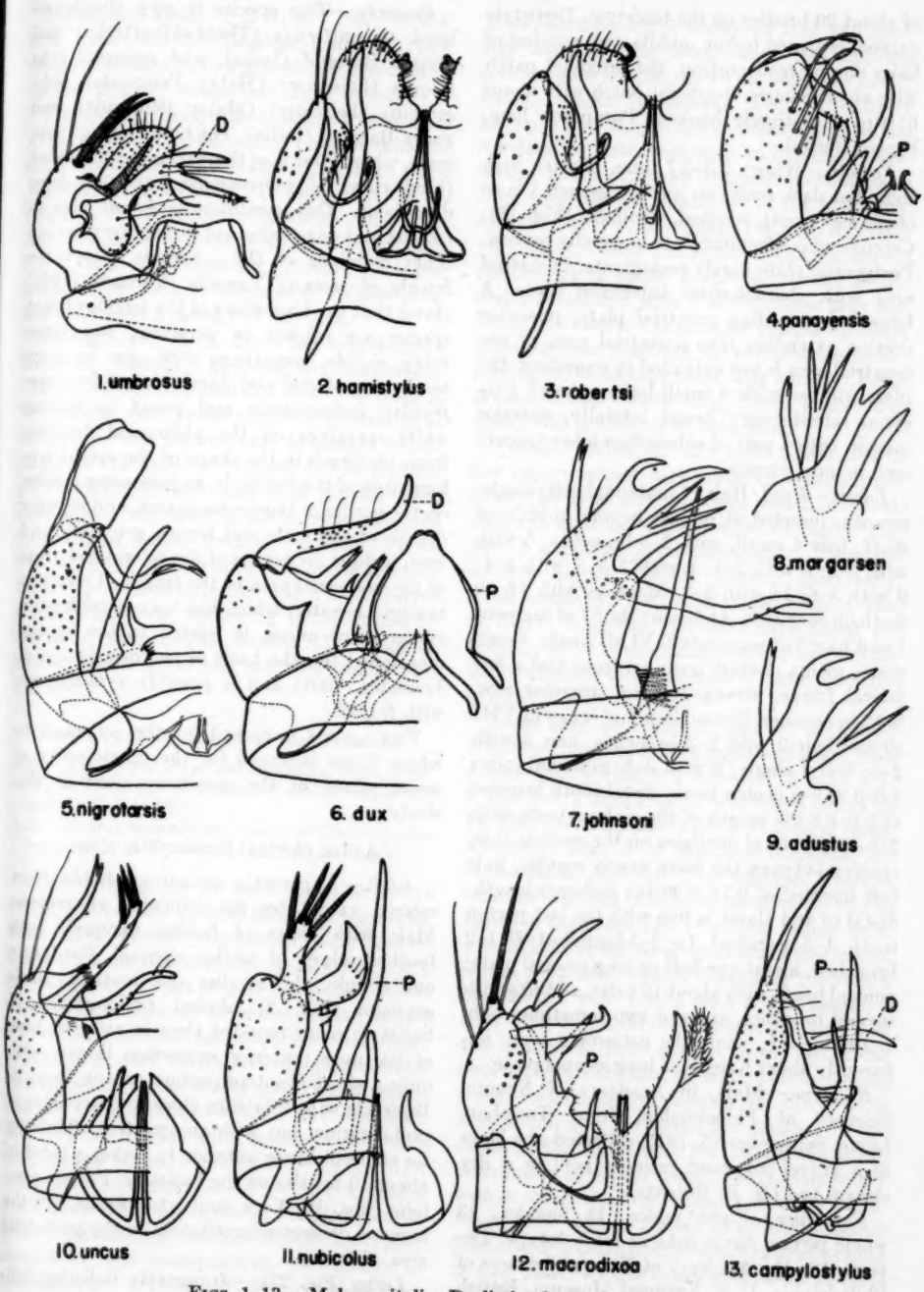
Mentum with 14–18 teeth on each side; prothoracic hair 2 single or double (usually double); prothoracic hair 8 single or double (usually single) ..... *johnsoni*, n. sp.
margarsen Dyar and Shannon

5. Dorsolateral hair (hair 6) of abdominal segment I single; pentad hair 1 of abdominal segment VIII single, pentad hair 3 with 2-3 branches; anal gills at least 5 times as long as anal plate ..... *robertsi*, n. sp.
hamistylus, n. sp.

Dorsolateral hair of segment I with 2 or more branches; pentad hair 1 with 3–5 branches, pentad hair 3 with at least 5 branches; anal gills not more than 3.5 times as long as anal plate ..... *nigrotarsis* (Ludlow)

Aedes (Aedes) robertsi, n. sp.

Male.—Wing: 1.8–2.1 mm. *Head:* About 10 verticillate bristles on most antennal segments; torus brownish yellow dorsolaterally, remainder dark brown, bare or with a few flat dark scales on median aspect. Head scales mostly flat dark brown, a lateral patch of flat white scales; 2 or 3 pale scales between the eyes; about 5 dark-brown, forked, upright scales on nape on each side of midline. *Thorax:* Integument of scutum and scutellum dark brown, clothed with golden-brown, narrow, curved scales, black in some lights. *Apn* brown, with about 7 large bristles, bristles, bare or with some flat pale scales. *Ppn* brown, bare. Pleuron brown. Anterior median portion of sternopleuron bare. About 10 bristles on upper part of mesepimeron, remainder of mesepimeron without bristles or hairs. Meteusternum bare. Claws of fore and midlegs unequal, the larger ones toothed, the smaller ones simple; claws of hind legs small, equal, toothed. *Abdomen*: Tergites all brown except for a pale lateral patch on segment I. Sternites entirely brown. *Genitalia* (Fig. 3): Basistyle with a large apical prolongation directed mesad, joined to the prolongation of the opposite side by a short sclerotized bar. Prolongation with a stout spine on inner posterior surface, directed medially and posteriorly, then curving ventrally and posteriorly. Two strong bristles close to outer base of prolongation, several other bristles very close to these, a total



FIGS. 1–13.—Male genitalia. D, dististyle; P, paraproct.

of about 20 bristles on the basistyle. Dististyle curved, enlarged before middle, two patches of hairs on enlarged portion, the proximal patch with about 8 hairs, the distal patch with about 6; tip of dististyle hooked. Paraproct long, curved dorsad.

Female.—Wing: 2.3–2.7 mm. Torus with some flat dark scales on median aspect. Claws of all legs equal, toothed. *Genitalia* (Fig. 15): Cercus and postgenital plate unusually narrow. Postgenital plate barely emarginate. Postatrial area with characteristic thickened areas. A large hairy median preatrial plate, posterior portion extending into postatrial area (if the preatrial area is not extended in mounting, the plate will resemble a small hairy sphere). Preatrial sclerite very broad laterally, anterior margin with a pair of submedian lobes (poorly seen in most views).

Larva.—Head: Hair 11 (antennal tuft) single, smooth, inserted at or just beyond middle of shaft; hair 4 small, with 2–3 branches; 5 with with 2–3; 6 with 2–4; 7 with 2–5; 8 with 2–4; 9 with 3–6; 14 with 2–3. Mentum with 16–19 teeth on each side. *Abdomen:* Hair 7 of segment I and hair 6 of segments I–VI all single. Comb scales with a distinct terminal spine and a fine lateral fringe, arranged in an irregular row, 9–12 in number. Pentad hair 1 of segment VIII single; hair 2 with 1–3 branches; hair 3 with 2–5; hair 4 single; 5 with 3–5. Siphonal index 3.6–3.9; 5–8 pecten teeth, distal tooth inserted at 0.6–0.8 the length of the siphon, teeth with 2–5 small lateral denticles on the ventral side, spacing between the teeth nearly regular; hair tuft inserted at 0.75–0.90 the siphonal length, distal to and about in line with the last pecten tooth, 1–3-branched. *Isc* 2–3-branched; *Ih* 1–2 branched, about one-half as long as anal plate; ventral brush with about 12 tufts, all tufts with several branches, anterior two sometimes only 1–2-branched; anal gills extremely long, apparently about 6 times as long as anal plate.

Holotype.—Male, in Academy of Natural Sciences of Philadelphia, from Tacloban, Leyte, September 15, 1945, collected as a larva in a gravel-bottomed residual pool in a dry stream bed (H. R. Roberts).

Paratypes.—Eight males, 11 females, 13 whole larvae. Same data as for holotype. Deposited in the Academy of Natural Sciences of Philadelphia, U. S. National Museum, British Museum, and California Academy of Sciences.

Remarks.—This species is very closely related to *uniformis* (Theobald) (India) and *abditus* Barraud (India), and apparently to *fragilis* (Leicester) (Malay Peninsula), *indecorabilis* (Leicester) (Malay Peninsula), and *yusafi* Barraud (India). The hind claws of both sexes, where known, of these species are toothed (hind claws of *indecorabilis* have not been described). This condition is found also in *robertsi* and *hamistylus* but is unknown in any other members of the subgenus except the female of *esoensis* Yamada. Yamada (1921) states that the hind claws of the female of that species are subject to variation, sometimes being simple, sometimes with one or more teeth. *A. robertsi* and *hamistylus* differ from *fragilis*, *indecorabilis*, and *yusafi* in lacking white markings on the abdominal tergites; from *uniformis* in the shape of the apical prolongation of the basistyle, in possessing a spine on the border of this prolongation, and in other details of the male and female genitalia; and from *abditus* in details of the sclerotized areas of the postatrial area of the female. *Verrallina malayi* Leicester, which has been considered a synonym of *uncus*, is related to the species mentioned (on the basis of the description of Leicester, 1908) and is possibly synonymous with *fragilis*.

This species is named for the collector, to whom I am indebted for the opportunity of seeing many of the specimens used in this study.

Aedes (Aedes) hamistylus, n. sp.

Adult.—Apparently indistinguishable from *robertsi* except by the following characters: Male with claws of foreleg unequal, both toothed; claws of midleg unequal, the larger one simple, the smaller one toothed. *Male genitalia* (Fig. 2): Apical prolongation of basistyle more rounded than in *robertsi*, base of its inner posterior projection larger, with only a short blunt projection arising from it. Basistyle with 2 bristles close to outer base of prolongation, but with an area free of bristles for some distance anterior to these, a total of about 10 bristles on the basistyle. *Female genitalia* (Fig. 16): Very similar to *robertsi*, but the areas of densest sclerotization in the postatrial area differing.

Larva (Fig. 25).—Apparently indistinguishable from *robertsi*.

Holotype.—Male, U.S.N.M. No. 57974, from Cape Melville, Balabac, June 23, 1945, collected as a larva in a gravel-bottomed residual pool in a dry stream bed (Jean Laffoon).

Paratypes.—Forty-one males, 63 females, 8 whole larvae, 4 larval skins, 1 pupal skin (all skins associated with adults). BALABAC: Cape Melville, June 1945 (A. T. Fitzjarrell, D. R. Johnson, Jean Laffoon). MINDORO: San José, April and May 1945 (E. S. Ross). Deposited in U. S. National Museum, British Museum, Academy of Natural Sciences of Philadelphia, and California Academy of Sciences.

Biology.—Dr. E. S. Ross has supplied the following notes in a personal communication. "My series was collected in a *Pandanus* swamp. The larvae were never observed breathing at the surface and seemed able to remain indefinitely at the bottom because of the possible gill function of their long anal papillae with pronounced tracheation. They were collected by dredging leaves from the bottom. Pupae were common at the surface. In the laboratory the larvae seemed to prefer hiding under leaves in the culture jars, 'attaching' to the surface by means of their mouth brushes. The papillae appear bluish white and are held widely outspread."

Aedes (Aedes) dux Dyar and Shannon

Aedes (Aedes) dux Dyar and Shannon, 1925, p. 81. (Type locality: Philippine Islands. Holotype male in U.S.N.M.)

Aedes (Aedes) macrodixoa Dyar and Shannon, Bohart, 1945; p. 65 and fig. 52 (female only).

Male.—Wing: 1.6–2.0 mm. *Head:* About 10 verticillate bristles on most antennal segments; torus dark brown, sometimes paler dorsolaterally, bare. Head scales mostly flat, dark brown; a lateral spot of pale flat scales; sometimes a few narrow curved scales bordering eye, a few pale flattened scales between the eyes; about 5 tiny, dark brown, forked, upright scales on nape on each side of midline (often hidden). *Thorax:* Integument of scutum and scutellum dark brown, clothed with golden-brown, narrow, curved scales, black in some lights. *Apn* with about 8 bristles, bare. *Ppn* bare or with a few narrow scales along dorsal margin. Pleuron brown. About 3–7 bristles along the upper margin of the mesepimeron, remainder of mesepimeron without bristles or hairs, occasionally 1 or 2 hairs behind scale patch. Meteusternum bare. Claws on fore and midlegs unequal, the larger ones toothed, the smaller ones simple; claws on hind legs small, equal, simple. *Abdomen:* Tergites entirely brown except tergite I pale-scaled laterally, last few tergites sometimes with an indefinite basolateral patch of brown scales somewhat paler than those on the remainder of the abdomen. Sternites brown. *Genitalia* (Fig. 6): Basistyle very short, along the inner margin a heavy, double-tipped spine, a shorter curved spine, and a projection with 2 small spines near tip. Dististyle inserted near outer margin apically, enlarged near base and curved posteriorly before apex, numerous hairs near middle. Paraprocts slender, fairly long, tenth tergite distinct, with numerous minute hairs.

Female.—Wing: 2.1–2.6 mm. Torus with a few rather narrow dark scales on inner aspect. Claws on fore and mid legs equal, toothed; claws on hind leg equal, simple. *Genitalia* (Fig. 19): Postgenital plate emarginate. Postatrial sclerite narrow, barely convex posteriorly, weak medially. Postatrial plate with a pair of hairy, fingerlike processes articulated anteriorly, a row of short hairs extending medially and posteriorly from the base of these. Preatrial sclerites widely disjoined.

Larva (Fig. 29).—*Head:* Hair 11 with 5–10 branches, inserted before middle of shaft; hair 4 very small, with 3–5 branches; 5 with 2–4; 6 with 3–4; 7 with 7–12; 8 with 2–3; 9 with 1–3; 14 with 2–5. Mentum with 8–11 lateral teeth. *Abdomen:* Hair 6 of segment I double, occasionally triple; hair 7 of segment I single; hair 6 of segment II double, occasionally triple; hair 6 of segments III–VI single. Comb scales with a distinct terminal spine and a fine lateral fringe, 8–13 in number. Pentad hair 1 with 3–6 branches; 2 with 1–2; 3 with 5–8; 4 single; 5 with 6–10. Siphonal index about 2.6; hair tuft 4–8 branched; 7–13 pecten teeth, last tooth inserted before middle, all teeth usually having a well-formed lateral denticle on the ventral side, tending to be somewhat smaller on the distal teeth, sometimes 3–4 lateral denticles, dorsal side of spines usually bare, sometimes with a small denticle; distal 1–3 teeth somewhat more widely spaced than those nearer base. *Isc* 5–8 branched; *lh* single, about as long as anal plate; ventral brush with about 12 tufts of which at least the anterior one is off the well-developed grid, each tuft many-branched;

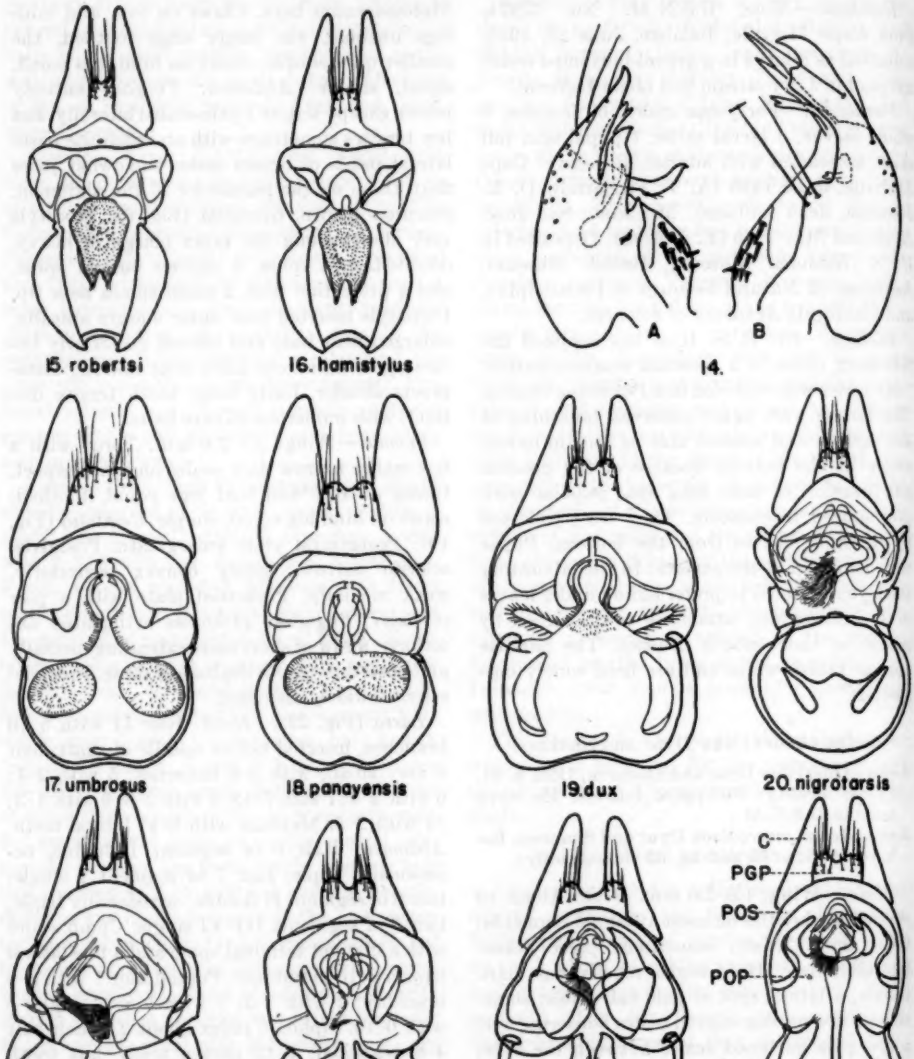


FIG. 14, *a* and *b*.—Genitalia of a male from Balabac (see remarks under *adustus*).
FIGS. 15–24.—Female genitalia. C, cercus; PGP, postgenital plate; POS, postatrial sclerite; POP, postatrial plate; PRP, preatrial plate; PRS, preatrial sclerite.

anal gills slightly tapering, bluntly tipped, 1.0–1.5 times the length of the anal plate.

Biology.—The larvae have been collected in fresh water in footprints in a ricefield near a mangrove swamp. N. Angeles reared a series from eggs in the laboratory in fresh water. Causey (1937) stated that "larvae were found in fresh and brackish water." The adults have been taken in light traps.

Distribution.—Specimens have been examined from the following localities: LUZÓN: Camp Nichols, Rizal (Pvt. Carraway, J. J. Larkin, R. F. Longacre, G. McDonald); Las Pinas, Rizal (F. E. Baisas); Tungkong Manga, San José, Bulacan (N. Angeles); Manila (D. Fox, Harry Hoogstraal); Subic Bay (M. J. MacMillan); Camp Stotsenberg, Pampanga. MINDORO: Caminawit Point (G. H. Penn); MINDANAO: Zamboanga (K. L. Knight, Jean Laffoon). Previously recorded from Luzón, Java, Singapore, and Siam.

Remarks.—The male and female genitalia readily separate this from all other known species except *sigmoides* Barraud, which Causey (1937) considered a synonym of *dux*. However, Barraud states that the holotype of *sigmoides* has white basolateral abdominal spots, and as Philippine specimens of *dux* lack such spots, this synonomy must be considered questionable at present. The female which Bohart (1945) figured as *macrodixoa* has been examined and found to be *dux*.

Aedes (Aedes) johnsoni, n. sp.

Male.—Wing: 2.5–2.9 mm. *Head:* Over 20 verticillate bristles on most antennal segments; torus brownish yellow dorsolaterally, remainder dark brown, a few very small, rather narrow, dark-brown scales medially. Head scales mostly flat, dark brown; a lateral patch of flat white scales; usually some narrow, curved, golden scales behind the eyes, extending downward for a short distance between the eyes; a number of dark brown, forked, upright scales on nape, sometimes a few pale flat scales near their bases; often a few golden, narrow, curved scales along the midline, sometimes extending forward to the eye border. *Thorax:* Integument of scutum and scutellum dark brown, clothed with golden-brown, narrow, curved scales, black in some lights, paler scales on anterior margin of scutum and above the wing base. *Apn* with about 12 large and some smaller bristles, bare or with a few flat white scales, rarely with a few pale narrow curved scales. *Ppn* usually with light-brown, narrow, curved scales on the dorsal half, sometimes with a few flat pale scales, sometimes bare. Pleuron dark brown. Anterior median angle of sternopleuron without scales or hairs. A number of bristles along the upper margin of the mesepimeron, numerous fine hairs posterior and ventral to the scale patch, ventral one-fourth of sclerite bare. Meteusternum with numerous fine pale hairs anteriorly. Claws on fore and mid legs unequal, the larger ones with a distinct tooth, the smaller ones simple; claws on hind leg small, equal, simple. *Abdomen:* Tergites dark brown with basolateral white spots on segments II–VIII with apices directed dorsoposteriorly, sometimes barely produced onto the dorsum of some segments. Sternites II–VII with white scales basally, brown scales apically; sternite VIII all white. *Genitalia* (Fig. 7): Basistyle with a long, wide, flattened prolongation apically on the dorsal aspect, this process much wider than any of the other processes, prolongation with a deep rounded notch apically, the anterior fork about twice as long as the posterior. Ventral to this prolongation three other subapical processes, the first split near the tip, the second a 3–4-branched forklike process, the third a long simple process. About 8 strong spines on ventral aspect of basistyle near base. Dististyle subapical, slender, curved, 2 hairs arising before tip. Paraproct very long, simple.

Female.—Wing: 2.8–3.6 mm. Torus with a few dark scales medially. Claws of fore and mid legs equal, toothed; claws of hind legs equal, simple. Abdominal spots somewhat larger than in male, usually visible from above on segments II–VIII. Sternite VIII mostly brown. *Genitalia* (Fig. 23): Postgenital plate emarginate. Postatrial sclerite narrow, unevenly rounded. Postatrial plate broad, with a characteristic posterior arm. Postatrial hairs confined to median area. Preatrial plates proximated but not united.

Larva.—Head: Head hair 11 with 3–5 feebly plumose branches, inserted before middle of shaft; hair 4 very small, with 4–7 branches; 5 with 5–10; 6 with 4–8; 7 with 10–14; 8 with 1–2; 9 with 3–6; 14 with 3–5. Mentum with 14–18 teeth on each side (average of 102 cases, 15.7). *Thorax:* Prothoracic hair 2 single or double (usually double); hair 8 single or double

(usually single). *Abdomen:* Hair 6 of segment I double; hair 7 single, rarely double; hair 6 of segment II double, occasionally triple; hair 6 of segments III–VI single, one or more sometimes double. Comb scales with a distinct terminal spine and a fine lateral fringe, 10–14 in number. Pentad hair 1 of segment VIII with 4–6 branches, 2 double, 3 with 3–7, 4 double, 5 with 6–9. Siphonal index about 3.0; 14–20 pecten teeth, distal tooth inserted beyond middle, basal teeth with 1–3 small lateral denticles, distal 2–5 teeth simple or with a very small lateral denticle, distal 2–5 teeth more widely spaced than those nearer base; siphonal tuft 2–5-branched. *Isc* 5–7-branched; *lh* single, shorter than anal plate; ventral brush with about 12 tufts, each tuft many-branched; anal gills lanceolate, pointed, the dorsal pair slightly longer than the ventral pair, 1.9–3.0 times length of the anal plate.

Holotype.—Male, with associated larval and pupal skins, U.S.N.M. No. 57975, from Pasananonco, Mindanao (near Zamboanga), September 18, 1945, collected in a muddy road rut in a coconut grove (D. R. Johnson).

Paratypes.—Forty-one males, 44 females, 15 whole larvae, 38 larval skins, 37 pupal skins (all skins associated with adults). MINDANAO: San Ramón, Zamboanga and Pasanonco, September 1945 (K. L. Knight, D. R. Johnson, Jean Laffoon). BASILÁN: Isabela, September 1945 (K. L. Knight). LEYTE: Tanauan, November 1944 (H. R. Roberts). Deposited in U. S. National Museum, British Museum, Academy of Natural Sciences of Philadelphia, and California Academy of Sciences.

Biology.—The larvae have been collected several times in muddy pools and road ruts. Adults have been taken in the jungle during the day.

Remarks.—*A. andamanensis, margarsen, adustus,* and the present species form a very closely knit complex. They are distinct from all other known species in the character of the prolongation and processes at the apex of the basistyle. The three Philippine species differ from other Philippine *Aedes* (*Aedes*) in the presence of numerous fine hairs on the meteusternum. From the description and figures of *andamanensis* (Edwards, 1922; Barraud, 1928 and 1934) and from examination of adults and genitalia of the three Philippine species, it would appear that the only method of separating the four members of this complex is by means of the male genitalia. These differ from each other in the character of the prolongation and processes at the apex of the basistyle. The three Philippine forms should perhaps be considered subspecies of *andamanensis,* but until a study can be made of their biology and of more material from various parts of the range, it is thought best to recognize them as full species. The larvae of *johnsoni* and *adustus* are apparently indistinguishable and the larva of *campylostylus* is very similar.

This species is named for one of the collectors, D. R. Johnson, whose interest in mosquito collecting has added materially to the knowledge of the Philippine mosquito fauna.

Aedes (Aedes) adustus, n. sp.

Adult.—The external characters and female genitalia appear to be indistinguishable from *andamanensis, johnsoni,* and *margarsen. Male genitalia* (Fig. 9): Very similar to the three species mentioned. The most ventral of the processes at the apex of the basistyle is very short (difficult to find, apparently absent in some specimens), while in the three closely related species it is well developed. Only 2–3 branches in the forklike subapical process. Apicodorsal prolongation of basistyle with anterior fork only slightly longer than posterior.

Larva.—Unknown.

Holotype.—Male, U.S.N.M. No. 57976, from Cape Melville, Balabac, P.I., June 23, 1945 (D. E. Howell), reared from larva collected in a shaded road rut.

Paratypes.—Six males, 6 females. Same locality and date as holotype (D. R. Johnson, Jean Laffoon, A. T. Fitzjarrell). Deposited in U. S. National Museum and British Museum.

Biology.—The larvae have been collected in shaded road ruts and in a shaded, gravel-bottomed residual pool in a dry stream bed.

Remarks.—A very unusual specimen was taken as a larva in the residual pool from which part of the type series of *adustus* was taken. It is inseparable from the male of *adustus* on external characters, but the genitalia (Fig. 14, *a* and *b*) are asymmetrical. One side is rather similar to *adustus,* while the other is very odd, showing some similarity to *campylostylus* and some to *adustus.* The larvae of *campylostylus, hamistylus,* and *uncus* were collected in this

same pool. The specimen is in the U. S. National Museum.

Aedes (Aedes) margarsen Dyar and Shannon

Aedes (Aedes) margarsen Dyar and Shannon, 1925, p. 80. (Type locality: Camp Eldridge, Laguna, Luzón. Male lectotype here designated from series of 4 male and 4 female cotypes, in U.S.N.M.)

Adult.—Apparently indistinguishable on external characters or on the female genitalia from *andamanensis, johnsoni,* and *adustus.* The white markings on abdominal tergites of female extremely variable; a pale, subbasal, median spot often present on I, II–VII often with lateral spots produced well onto dorsum, sometimes forming a complete transverse subbasal band. *Male genitalia* (Fig. 8): Very similar to *johnsoni* and *andamanensis* except that the apicodorsal prolongation of the basistyle is narrower, not much wider than the other subapical processes; 2–4 branches in the forklike subapical process.

Larva.—Apparently inseparable from the larva of *johnsoni.* The mentum has 13–17 teeth on each side (average of 28 cases, 14.5).

Biology.—The larvae have been taken in road rut pools.

Distribution.—Material has been examined from the following localities: LUZÓN: Camp Eldridge (E. Vazquez); Los Banos and Calamias, Laguna (F. E. Baisas); Tungkong Manga San José, Bulacan (N. Angeles); Subic Bay (F. E. Zedeck); San Anastacio (A. B. Gurney). MINDORO: San José (E. S. Ross).

Remarks.—Napoleon Angeles has reared a series from eggs from a known adult at Tungkong Manga. The transverse abdominal bands are complete in some of the females in this series, and broadly interrupted in others.

Aedes (Aedes) nubicolus, n. sp.

Aedes (Aedes) uncus (Theobald), Bohart, 1945, p. 66 and fig. 50 (male only).

Male.—Wing: 3.0 mm. *Head:* Over 20 verticillate bristles on most antennal segments; torus dark brown ventrally, paler dorsally. Head scales mostly flat dark brown, a lateral patch of flat, white scales, a few pale scales along eye border and between the eyes, a few pale scales anterior to nape, about 20 brown forked upright scales on nape on each side of midline. *Thorax:* Integument of scutum and scutellum orange-brown, clothed with golden, narrow, curved scales, black in some lights, paler scales on anterior border of scutum and above wing bases. *Apn* orange-brown with about 10 bristles. *Ppn* orange-brown with a few scales on the dorsal half similar to those on the scutum. Pleuron orange-brown. About 15 hairs on anterior median part of sternopleuron. About 15 upper mesepimeral bristles and numerous hairs on the posterior and ventral parts of this sclerite, extending into the ventral one-fourth. Claws of fore and mid legs unequal, the larger ones toothed, the smaller ones simple; claws of hind legs small, equal, simple. *Abdomen:* Tergites dark brown, II–VIII with white basolateral spots with apices directed dorsoposteriorly, barely visible from above on segments IV–VII. Sternites mostly white. *Genitalia* (Fig. 11): Basistyle with a fairly short subapical process dorsally, bearing about 4 very heavy spines apically and several bristles. Inner aspect of basistyle with a rather small triangular sclerotized plate. Dististyle subapical, simple, very broad near middle, about 8 fine hairs near the widest part. Paraproct simple, very long.

Female and larva.—Unknown.

Holotype.—Male, in Museum of Comparative Zoology, from Sibulan River at 7,000–8,000 feet on Mount Apo (near Dávao), Mindanao, September 23 (C. S. Clagg).

Paratype.—Male, same data as for holotype. Deposited in Museum of Comparative Zoology.

Remarks.—This species is apparently indistinguishable externally from *macrodixoa* and *uncus.* The male genitalia are distinct from all species for which the male is known, but it is not impossible that this may be the male of some species of which the female only is known at present.

Aedes (Aedes) uncus (Theobald)

Culex uncus Theobald, 1901, p. 53. (Type locality: Selangor, Malay Peninsula. Type: Female in British Museum.)

Aedes (Aedes) uncus (Theobald), Bohart, 1945, p. 66 and fig. 56 (female only).

Male.—Wing: 2.6–3.0 mm. *Head:* Over 20 verticillate bristles on most antennal segments; torus dark brown ventrally, paler dorsally, bare. Head scales mostly flat dark brown, a lateral patch of flat, white scales, a few pale scales along eye margin and between the eyes, a

few narrow pale scales along the midline, at least 15 dark-brown, forked, upright scales on nape on each side of midline. *Thorax:* Integument of scutum and scutellum orange-brown, clothed with golden-brown, narrow, curved scales, black in some lights, paler scales on anterior border of scutum and above wing base. *Apn* orange-brown with about 7 large and some smaller bristles. *Ppn* brown, with some fine hairs and a number of scales on the dorsal half similar to those on the scutum. Pleuron orange-brown. About 15 hairs on anterior part of sternopleuron. About 15 upper mesepimeral bristles and numerous hairs on the posterior and ventral parts of this sclerite, extending into the ventral one-fourth. Claws of fore and mid legs unequal, the larger ones toothed, the smaller ones simple; claws of hind leg equal, small, simple. *Abdomen:* Tergites dark brown, II–VIII with white basolateral spots with apices directed dorsoposteriorly, barely visible from above. Sternites I–VII mostly white, with a few brown scales apically; sternite VIII all white. *Genitalia* (Fig. 10): Basistyle with two long processes. Posterior process split near tip, without bristles, the other with 3–4 large heavy spines near apex and 2 or 3 small bristles along length. An irregular row of about 9 stout spines along inner ventral margin. Inner aspect with a small subtriangular spine. Dististyle simple, slightly enlarged near middle, 2 small subapical hairs and about 10 hairs nearer middle. Paraproct short, simple.

Female.—Wing: 3.1–3.8 mm. Torus with a few flat dark scales on inner aspect. Claws of fore and mid legs equal, toothed; claws of hind leg equal, simple. Sternite VIII all brown. *Genitalia* (Fig. 21): Postgenital plate deeply emarginate. Postatrial sclerite wide, very convex, widened laterally. Postatrial plate of characteristic shape. Postatrial hairs fairly long, some of them well removed from median line. Preatrial plates united for most of their length.

Larva.—Unknown.

Biology.—The larvae have been taken in various types of temporary ground pools, including shaded grassy ground pools, a leaf-filled jungle pool, a sunlit rocky pool, and a shaded gravel-bottomed residual pool in a dry stream bed. Adults have been captured biting man during the day in shaded areas.

Distribution.—Specimens have been examined from the following localities in the Philippines: CULION: (Jean Laffoon). PALAWAN: Puerto Princesa (Jean Laffoon, R. C. McGregor, J. P. Toffaleti); Irahuan River Valley (D. R. Johnson). BALABAC: Cape Melville (D. R. Johnson, Jean Laffoon). Previously recorded from the Malay Peninsula and Palawan. Bohart (1945) records this species from Mount Apo, Mindanao, but the specimens on which this identification was based are the types of *nubicolus*.

Remarks.—This species is apparently indistinguishable externally from *macrodixoa* and *nubicolus*. The male genitalia agree well with the figure given by Edwards (1917). As Edwards stated that the male he figured was only arbitrarily associated with the type female of *uncus* and as the female genitalia of the holotype of *uncus* have not been described, it is possible that the present species is not true *uncus*.

Edwards (1913, etc.) has considered *Verrallina malayi* Leicester to be a synonym of *uncus*. Leicester (1908) described *malayi* as having all the claws toothed. This and other characters described by Leicester indicate that *malayi* is not a synonym of *uncus*, but is related to *uniformis* and the other species discussed under *robertsi*. It is possibly synonymous with *fragilis*, as suggested by Leicester in his original description.

Aedes (Aedes) macrodixoa Dyar and Shannon

Aedes (*Aedes*) *macrodixoa* Dyar and Shannon, 1925, p. 77. (Type locality: Infanta, Tayabas, Luzón. Male holotype in U.S.N.M.)

Aedes (*Aedes*) *macrodixoa* Dyar and Shannon, Bohart, 1945, p. 65 and fig. 48 (male only).

Male.—Wing: 2.3–2.8 mm. *Head:* Over 20 verticillate bristles on most antennal segments; torus brown to dark brown ventrally, paler dorsally, bare. Head scales mostly flat, dark brown, a lateral patch of pale flat scales; 2 or 3 pale narrow scales between the eyes, a few pale scales along the eye margin, sometimes a few pale narrow scales along midline, at least 15 dark brown, forked, upright scales on nape on each side of midline. *Thorax:* Integument of scutum and scutellum orange-brown, clothed with golden-brown, narrow, curved scales, black in some lights, paler scales on anterior border of scutum and above the wing base. *Apn* orange-brown to brown, with about 9 bristles, bare. *Ppn* brown, with some narrow curved

scales on the dorsal half similar to those on the scutum, sometimes with a few flat white scales. Pleuron brown. Anterior median portion of sternopleuron with about 10–15 hairs. About 20 bristles along upper margin of mesepimeron, numerous hairs posterior and ventral to the scale patch, extending into the ventral one-fourth of this sclerite. Meteusternum bare. Claws of fore and mid legs unequal, the larger ones toothed, the smaller ones simple; claws of hind legs small, equal, simple. *Abdomen:* Tergites dark brown, II–VIII with basolateral white spots with apices directed dorsoposteriorly, not visible from above. Sternites I–VII almost entirely white, but usually with a few brown scales apically; sternite VIII all white. *Genitalia* (Fig. 12): Basistyle with a conical lobe subapically on the ventrolateral aspect (appearing triangular in flat preparation) with 1 or 2 very heavy bristles apically and several more slender bristles before the tip; dorsad and mesad to this a long process with a single bristle on the outer margin before the middle. On the inner ventral margin near the base a fairly long process with a single bristle on the inner margin before the middle. A short, blunt, nonsclerotized process on the inner aspect close to insertion of dististyle. Dististyle simple, without hairs or bristles. Basistyle with a patch of about 8–12 long bristles near inner dorsal margin, remainder of dorsal aspect without bristles. Sclerotized portion of paraproct very short. Ninth tergite with a very large Y-shaped process posteriorly, each fork with a very hairy ventral branch, main branch smooth dorsally, with a few hairs ventrally.

Female.—Wing: 3.0–3.8 mm. Torus with a few flat dark scales on inner aspect. Claws of fore and mid legs equal, toothed; claws of hind legs equal, simple. Abdominal spots visible from above on segments II–VII. Sternite VIII all brown. *Genitalia* (Fig. 22): Postgenital plate emarginate. Postatrial sclerite wide laterally, narrowed and slightly convex medially. Postatrial plate broadly united with postatrial sclerite, shape characteristic. Postatrial hairs very short, confined to median area. Preatrial plates not united.

Larva.—Unknown.

Biology.—Adults were bred from larvae taken in a temporary leaf-filled pool. The adult has been captured in dense jungle during the day.

Distribution.—Specimens have been examined from the following localities: LUZÓN: Infanta, Tayabas. MINDORO: San José (E. S. Ross). LEYTE: Tacloban (H. R. Roberts). MINDANAO: Mercedes (Jean Laffoon); Parang (J. C. Gregory). The only valid previous record of this species is of the holotype.

Remarks.—This species is apparently indistinguishable externally from *uncus* and *nubicolus*. The female which Bohart (1945) identified and figured as *macrodixoa* has been examined and found to be *dux*. The male figured by Brug (1932) as *macrodixoa* from near the Upper Digoel River in southern Dutch New Guinea is an undescribed species. Additional specimens of this new species from New Guinea are in the National Museum. It differs from *macrodixoa* in the shape and length of the subapical projection of the ventral aspect of the basistyle and in the number of bristles in the patch along the inner dorsal margin of the basistyle (8–12 in *macrodixoa*, 16–22 in the form from New Guinea).

Aedes (Aedes) nigrotarsis (Ludlow)

Pseudoskusea nigrotarsis Ludlow, 1908, p. 52. (Type locality: Infanta, Luzón. Holotype female, U.S.N.M. No. 57979.)

Pseudoskusea mediolineata Ludlow, 1908, p. 332.

Male.—Wing: 2.2–2.6 mm. *Head:* over 20 verticillate bristles on most antennal segments; torus dark brown, with a few tiny, rather narrow, dark scales medially. Head scales mostly flat dark brown, a lateral patch of flat pale scales, sometimes 2 or 3 pale narrow curved scales behind eye margin, sometimes a few narrow pale scales along midline, 20 or more forked upright scales on nape on each side of midline. *Thorax:* Integument of scutum and scutellum blackish brown, clothed with golden-brown, narrow, curved scales, black in some lights. *Apn* with about 8 large bristles and some smaller ones, without scales. *Ppn* with a few light-brown, narrow, curved scales on the dorsal half. Pleuron dark brown. Anterior median portion of sternopleuron bare. A number of bristles along the upper border of the mesepimeron, sometimes up to 3 or 4 small hairs behind scale patch, always bare below. Claws on fore and mid legs unequal, the larger ones toothed, the smaller ones simple; claws on hind leg small, equal, simple. *Abdomen:* Tergites dark brown with basolateral white patches

with apices directed dorsoposteriorly, usually not visible from above, sometimes barely produced onto dorsum of segments VI and VII. Sternites II–VII brown, sternite VIII pale. *Genitalia* (Fig. 5): Basistyle with a very broad rectangular apical prolongation. Ventral margin with a triangular process near base. Dististyle slender, curved, with a short subapical hair and 2 short hairs arising from a short projection well beyond middle. Paraproct long, simple.

Female.—Wing: 2.5–3.0 mm. Torus with a few flat dark scales medially. Claws of fore and mid legs equal; toothed; claws of hind leg equal, simple. Tergites II–VII with lateral spots usually produced onto dorsum to form complete or nearly complete subbasal transverse white or yellowish bands. Sternite VIII brown. *Genitalia* (Fig. 20): Postgenital plate slightly emarginate, narrow. Postatrial sclerite very convex, very wide posteriorly and laterally. Postatrial area with several sclerotized areas and a large number of long hair-like processes with numerous branches, apparently anastomosing. A large, rounded, unpaired, very darkly pigmented preatrial plate, anterior to this a pair of smaller plates.

Larva (Fig. 28).—*Head:* Antenna uniformly light brown; head hair 11 with 2–5 feebly plumose branches, inserted before middle of shaft. Head hair 4 very small, with 4–6 branches; head hairs 5 and 6 with 3 branches (sometimes 2), the median branch always distinctly stouter and longer than the lateral branches; hair 7 with 7–11 branches; 8 with 2–4; 9 with 3–6; 14 with 2–5. Mentum with 16–19 teeth on each side. *Abdomen:* Hair 6 of segment I with 3–4 branches; hair 7 of segment I double; hair 6 of segment II with 2–4 branches; hair 6 of segments III–VI single, sometimes one or more double. Comb scales with a distinct terminal spine and a fine lateral fringe, 8–11 in number. Pentad hair 1 with 3–5 branches, 2 with 2–3, 3 with 7–13, 4 single, 5 with 8–12. Siphonal index about 2.0; hair tuft 2–6-branched; 8–14 pecten teeth, distal tooth inserted beyond middle; basal teeth with 1–3 lateral denticles; distal 2–5 teeth usually with only one very small lateral denticle; dorsal side of spines usually bare, occasionally with one or more denticles; distal 1–3 teeth more widely spaced than those nearer base. *Isc* 7–11-branched; *lh* single, about half as long as anal plate; ventral brush with about 14 tufts; anal gills lanceolate, pointed, dorsal pair 1.7–2.2 times the length of the anal plate, ventral pair slightly shorter.

Biology.—The larvae were taken several times in temporary grassy pools. Adults have been captured in light traps.

Distribution.—Specimens have been examined from the following localities: LUZÓN: Infanta; Subic Bay (E. S. Zolik); Camp Nichols, Rizal (Pvts. Carraway, Sinclair, and Williams); Calauan and Quezon City (F. E. Baisas); Wackwack and Manila (Harry Hoogstraal). SAMAR: Osmena (Jean Laffoon, L. E. Rozeboom). JINAMOC ISLAND (near Basey, Samar): (J. T. Medler). LEYTE: Tacloban (H. R. Roberts); Abuyog (O. H. Graham). MINDANAO: Zamboanga and San Ramón (K. L. Knight, Jean Laffoon). The species has previously been recorded only from Luzón.

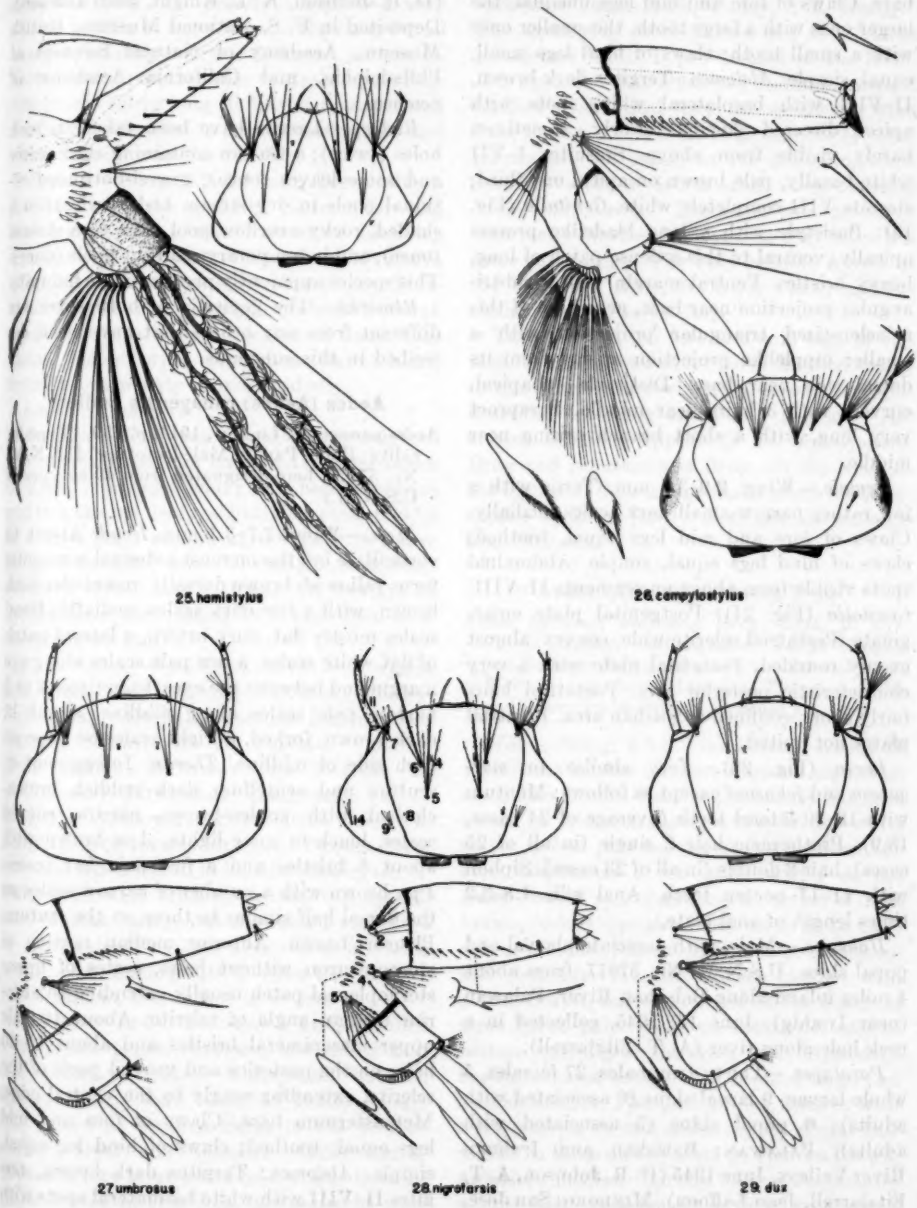
Remarks.—Dyar and Shannon (1925) stated that many of the smaller specimens of *nigrotarsis* lack abdominal spots. The entire collection of this species in the National Museum was examined for this character, and it was found that all specimens that had previously been identified as *nigrotarsis* (probably by Dyar and Shannon) and that were lacking abdominal spots were actually *dux*.

This species is closely related to *indicus* (Theobald). As pointed out Bohart (1945), the ventral process near the base of the basistyle is triangular in *nigrotarsis* but long and slender in *indicus*. A female of *indicus* from India was examined and the genitalia were found to apparently differ from *nigrotarsis* in not having the hairlike processes arising as far posteriorly as in *nigrotarsis* and in having a narrow longitudinal slit through most of the length of the unpaired preatrial plate.

Aedes (Aedes) campylostylus, n. sp.

Male.—Wing: 2.2–2.9 mm. *Head:* Over 20 verticillate bristles on most antennal segments; torus yellowish brown dorsally, remainder dark brown, bare or with a few flat dark scales medially. Head scales mostly flat, dark brown, a lateral patch of flat, white scales, a few pale scales along eye margin and between the eyes, sometimes a few pale scales along the midline, about 30 dark-brown, forked, upright scales on the nape of each side of the midline. *Thorax:*

Integument of scutum and scutellum dark reddish brown, clothed with golden-brown, narrow, curved scales, black in some lights. *Apn* reddish brown, with about 9 bristles, often with a few pale, flat scales. *Ppn* reddish brown with a few narrow, curved scales on the dorsal half similar to those on the scutum. Pleuron reddish brown. Anterior median portion of



FIGS. 25–29.—Larvae.

sternopleuron bare. About 8 pale upper mesepimeral bristles, posterior and ventral parts of mesepimeron without hairs or with up to about 4 posterior to the scale patch. Meteusternum bare. Claws of fore and mid legs unequal, the larger ones with a large tooth, the smaller ones with a small tooth; claws of hind legs small, equal, simple. *Abdomen:* Tergites dark brown, II–VIII with basolateral white spots with apices directed dorsoposteriorly, sometimes barely visible from above. Sternites I–VII white basally, pale brown on apical one-third; sternite VIII completely white. *Genitalia* (Fig. 13): Basistyle with a long bladelike process apically, ventral to this a dense patch of long, heavy bristles. Ventral margin with a subtriangular projection near base, near base of this a sclerotized triangular projection with a smaller nipplelike projection arising from its dorsal side near base. Dististyle subapical, curved, with 3 hairs near middle. Paraproct very long, with a short branch arising near middle.

Female.—Wing: 2.9–3.5 mm. Torus with a few rather narrow small dark scales medially. Claws of fore and mid legs equal, toothed; claws of hind legs equal, simple. Abdominal spots visible from above on segments II–VIII. *Genitalia* (Fig. 24): Postgenital plate emarginate. Postatrial sclerite wide, convex, almost evenly rounded. Postatrial plate with a very characteristic posterior arm. Postatrial hairs fairly short, confined to median area. Preatrial plates not united.

Larva (Fig. 26).—Very similar to *margarsen* and *johnsoni* except as follows: Mentum with 18–20 lateral teeth (average of 24 cases, 18.9). Prothoracic hair 2 single (in all of 25 cases); hair 8 double (in all of 23 cases). Siphon with 11–17 pecten teeth. Anal gills 1.8–3.2 times length of anal plate.

Holotype.—Male, with associated larval and pupal skins, U.S.N.M. No. 57977, from about 4 miles inland along Balsahan River, Palawan (near Iwahig), June 13, 1945, collected in a rock hole along river (A. T. Fitzjarrell).

Paratypes.—Thirty-two males, 27 females, 5 whole larvae, 9 larval skins (6 associated with adults); 6 pupal skins (5 associated with adults). PALAWAN: Balsahan and Irahuan River Valleys, June 1945 (D. R. Johnson, A. T. Fitzjarrell, Jean Laffoon). MINDORO: San José, April and May 1945 (E. S. Ross). BALABAC: Cape Melville, June 1945 (A. T. Fitzjarrell, D. R. Johnson, Jean Laffoon). LEYTE: Tacloban, September 1945 (H. R. Roberts). MINDANAO: San Ramón, September 1945 (D. R. Johnson, K. L. Knight, Jean Laffoon). Deposited in U. S. National Museum, British Museum, Academy of Natural Sciences of Philadelphia, and California Academy of Sciences.

Biology.—Larvae have been taken in rock holes (twice); a tin can containing clear water and some leaves (once); gravel-bottomed residual pools in dry stream beds (twice); in a shaded, rocky overflow pool close to a stream (once), and in temporary road rut pools (once). This species apparently prefers jungle habitats.

Remarks.—The genitalia of both sexes are different from any others that have been described in this subgenus.

Aedes (Aedes) panayensis Ludlow

Aedes panayensis Ludlow, 1914, p. 159. (Type locality: Iloilo, Panay. Male lectotype, U.S.N.M. No. 57978, here designated from 49 cotypes in U.S.N.M.)

Male.—Wing: 2.7–3.1 mm. *Head:* About 12 verticillate bristles on most antennal segments; torus yellowish brown dorsally, remainder dark brown, with a few dark scales medially. Head scales mostly flat, dark brown, a lateral patch of flat white scales, a few pale scales along eye margin and between the eyes, sometimes 2 or 3 narrow pale scales along midline, about 12 dark brown, forked, upright scales on nape on each side of midline. *Thorax:* Integument of scutum and scutellum dark reddish brown, clothed with golden-brown, narrow, curved scales, black in some lights. *Apn* brown with about 8 bristles and a few pale flat scales. *Ppn* brown with a number of narrow scales on the dorsal half similar to those on the scutum. Pleuron brown. Anterior median portion of sternopleuron without hairs, scales of upper sternopleural patch usually extending to anterior median angle of sclerite. About 10 pale upper mesepimeral bristles and about 15–20 hairs on the posterior and ventral parts of the sclerite, extending nearly to the ventral edge. Meteusternum bare. Claws of fore and mid legs equal, toothed; claws of hind leg equal, simple. *Abdomen:* Tergites dark brown, tergites II–VIII with white basolateral spots with apices directed dorsoposteriorly, sometimes

barely visible from above. Sternites I–VII with a wide basal band of pale scales, covering at least the basal one-half, remainder brown; sternite VIII with brown and white scales. *Genitalia* (Fig. 4): Basistyle with 3–4 very strong bristles in a row close to the inner dorsal margin; apically a broad flattened process directed mesad; on the inner ventral surface near the base a fairly long slightly curved process. Dististyle subapical, a fairly stout bristle and about 5 hairs near the middle.

Female.—Wing: 2.2–2.5 mm. Torus with a few flat dark scales medially. Claws of fore and mid legs equal, toothed; claws of hind leg equal, simple. Sternite VIII brown. *Genitalia* (Fig. 18): Postgenital plate emarginate. Postatrial sclerite nearly straight posteriorly, weak medially. Apparently no postatrial hairs. Preatrial plates with numerous short hairs, broadly but weakly united medially.

Larva.—Unknown.

Biology.—This species is apparently confined to coastal areas. The larvae have been taken in slightly brackish water in a beached canoe and in a shaded, leafy, slightly brackish puddle in a nipa palm swamp at the extreme upper limit of the tidal zone. The adults have been captured biting man in mangrove swamps in the daytime and resting in a crab hole in a mangrove swamp.

Distribution.—Specimens have been examined from the following localities: PANAY: Iloilo (Major Ewing). CALICOAN ISLAND (near Guiuan, Samar): (J. H. Paullus). CULION: (Jean Laffoon). BALABAC: Cape Melville (D. R. Johnson), MINDANAO: Zamboanga (K. L. Knight). MOROTAI: Point Gila (K. L. Knight). SCHOUTEN ISLANDS, DUTCH NEW GUINEA: Aioki Island in Padaido Group (A. G. Humes). Bohart (1945) recorded this species from Manila, Luzón, but this record was based on a misidentification. Dyar and Shannon (1925) and Bohart (1945) recorded it from Jolo Jolo, but this record is in error.

Remarks.—In her description Ludlow failed to designate types. However, she stated that this species is "rather widespread, but the first specimens were taken at Iloilo, Panay, P.I. Taken at various times in the various places." Dyar and Shannon (1925) stated, "Out of a very large series bred at one time by Major Ewing at Jola Jola, 49 specimens were found in a bottle labelled types." The 49 specimens mentioned are still in the National Museum. Only one bears any label in addition to the type label; this one reads, in what is presumably Ludlow's handwriting: "*Skusea multiplex* Theo. Iloilo, Panay, P.I. Ewing." The name was later crossed out and "*Aedes panayensis* Ludl. Types" added to the label. It is apparent that Dyar and Shannon misread Ludlow's label and that the specimens were from Panay. There are a large number of other specimens (not types) in the Museum, some entirely without labels and some labeled "Jola Jola, Ewing." The latter were probably incorrectly labelled by Dyar, as they have the same misspelling. The only reliable record in the literature, therefore, is for Panay and includes the type series only.

The claws of the fore and mid legs of the male of this species differ from all other males in this subgenus for which the claws have been described in being equal and toothed. The closest relatives appear to be *dermajoensis* Brug and *prioekanensis* Brug, on the basis of the figures of the male genitalia given for those species by Brug (1931). Both are known only from Sumatra.

Aedes (Aedes) umbrosus Brug

Aedes (*Skusea*) *umbrosus* Brug, 1924, p. 437. (Type locality: Undesignated, Tanah Grogot, southeastern Borneo (3 males and 2 females), or Weltevreden, Java (1 male). Types: 4 males and 2 females in British Museum.)

Male.—Wing: 2.0–2.4 mm. *Head:* About 20 verticillate bristles on most antennal segments; torus dark brown. Head scales mostly flat dark brown, a lateral transverse line of flat white scales, a few pale narrow scales between the eyes, sometimes a few pale narrow curved scales on each side of midline, a number of dark brown, forked, upright scales on nape on each side of midline. *Thorax:* Integument of scutum and scutellum blackish brown, clothed with golden-brown, narrow, curved scales, black in some lights, paler scales on anterior border of scutum and above the wing base. *Apn* dark brown, without scales, with about 6 large and 6 small bristles. *Ppn* dark brown, bare or with a few narrow curved scales on the dorsal half similar to those on the scutum. Pleuron brown. Anterior median portion of sternopleuron usually bare, occasionally with up to about 8 very small hairs. About 10 upper mesepimeral

bristles and always at least 10 hairs posterior and ventral to the scale patch, often much more numerous. Meteusternum bare. Claws of forelegs unequal, both toothed; claws of mid legs unequal, both simple; claws of hind legs small, equal, simple. *Abdomen:* Tergites dark brown, II–VIII with basolateral white spots with apices directed dorsoposteriorly, not visible from above. Sternites entirely dark brown, or with a variable number of white scales on the basal one-third only. *Genitalia* (Fig. 1): Basistyle short and broad, numerous scales basally on the dorsal aspect, but no bristles. Two very heavy proximated subapical dorsal spines, a shorter one basal to these, with a much shorter one basal to it. Dististyle inserted near middle, with a wide basal lobe, deeply forked, with about 9 bristles on the enlarged basal portion, 3 near the fork, and 2 very small spines and 2 very small hairs near the apex. Paraproct rather short.

Female.—Wing: 2.5–3.0 mm. Torus with a few dark flat scales on the median aspect. Claws on fore and mid legs equal, toothed; claws of hind leg equal, simple. *Genitalia* (Fig. 17): Postgenital plate rounded or barely emarginate. Postatrial sclerite slightly convex medially with nearly square posterolateral corners, giving a trilobed appearance to the posterior margin. Postatrial hairs short, preatrial plates rounded, broadly disjoined, with numerous short hairs.

Larva (Fig. 27).—*Head:* Hair 11 with 4–8 branches, inserted before middle of shaft; 4 very small, with 3–5 branches; 5 with 3–4; 6 with 2–4; 7 with 6–9; 8 with 3–6; 9 with 2–4; 14 with 2–5. Mentum with 11–13 lateral teeth. *Abdomen:* Hair 6 of segment I with 2–3 branches; hair 7 of segment I with 1–2 branches; hair 6 of segment II double; hair 6 of segments III–VI single. Comb scales with a complete apical fringe, no prominent terminal spine, 9–14 in number. Pentad hair 1 of segment VIII with 3–5 branches; 2 with 4–5; 3 with 6–11; 4 single; 5 with 8–14. Siphonal index 2.4–3.0; hair tuft 5–8-branched; 7–12 pecten teeth, distal tooth usually inserted before middle, sometimes just beyond, all teeth usually having a well-formed lateral denticle, tending to be somewhat smaller on the distal teeth, sometimes 3 or 4 lateral denticles, distal 1–2 teeth sometimes somewhat more widely spaced than those nearer base. *Isc* with 6–10 branches; *lh* single, at least as long as anal plate; ventral brush with about 12 tufts, the anterior two 1–5-branched, the remainder with 6–12 branches. Anal gills lanceolate, 0.8–1.5 times as long as anal plate.

Biology.—This species is probably never found far from the ocean, as all records are from coastal areas. Adults have been reared from larvae taken in a slightly brackish, shaded, leaf-filled puddle in a nipa palm swamp at the extreme upper limit of the tidal zone and in temporary, shaded, fresh-water, leaf-filled ground pools. Females have been captured biting during the day in a mangrove swamp. Edwards and Given (1928) report the larvae in "potholes and crab-holes in uncut mangrove."

Distribution.—Specimens have been examined from the following localities: LEYTE: Tacloban and Palo (H. R. Roberts). CULION: (Jean Laffoon). PALAWAN: Iwahig and Puerto Princesa (D. R. Johnson and Jean Laffoon). DUTCH BORNEO: Tarakan Island (off east coast of Borneo) (A. G. Humes). The species has previously been recorded from Dutch Borneo, Java, and Singapore.

Remarks.—This species may possibly be a synonym of *butleri* (Theobald), as it appears that the male which has been assigned to *butleri* does not belong to that species, but to *lugubris* Barraud, as indicated by the following facts:

In the original descriptions of *butleri* and *diurna* (Theobald) (which has been synonymized with *butleri*). Theobald (1901 and 1903) stated that their abdomens have basolateral spots but no transverse bands. Barraud (1928 and 1934) stated that *lugubris* (of which he had no males) has a narrow transverse white band on the second abdominal segment. There are two females in the National Museum that have this character and that agree well with Barraud's figure of the female genitalia of *lugubris*. As one of these specimens was taken as a larva along with two males and as the females agree well in external characters with the males, they are almost certainly one species. All four specimens were collected on the Malay Peninsula by Leicester and identified by Edwards in 1912 as *butleri*. The males are cospecific with the male described and figured by Edwards in Barraud (1934) as the male of *butleri*. Since the females examined are apparently cospecific with *lugubris*, this male is therefore *lugubris*,

unless Theobald failed to note the band on the second abdominal segment in the type of *butleri*, in which case *lugubris* is probably a synonym of *butleri*.

If the male considered here to be *lugubris* is not *butleri*, it is possible that *umbrosus* is a synonym of *butleri*, as there is nothing in the descriptions of *butleri* or *diurna* to exclude it and as both *butleri* and *umbrosus* are recorded from Malaya. Furthermore, Barraud described and figured the female genitalia of *butleri* from India, and his figure and descriptions agree well with the specimens here considered *umbrosus*.

Edwards (1913) made *Stegomyia hatiensis* Carter (known from females only) a synonym of *butleri*. In his original description of this species, Carter (1910) stated that the scutellum of *hatiensis* has "scales similar to those covering the greater part of the head," which would imply that the scutellar scales are flat. If this is true, *hatiensis* does not belong in this subgenus, and is probably a *Skusea*.

These questions can not be satisfactorily settled until the genitalia of the type females of *butleri*, *diurna*, and *hatiensis* have been studied.

The species considered *umbrosus* in this paper can be separated from the four specimens mentioned as having been identified by Edwards as *butleri*, but which are probably *lugubris*, by the male and female genitalia, by the absence of a narrow transverse subbasal white band on the second abdominal segment of the female of *umbrosus* and its presence in the other species, and by the extent of the hairy area of the lower part of the mesepimeron (usually extending below the scale patch in *umbrosus*, confined to a posterior row behind the scale patch in *butleri*).

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ZOOLOGY.—*Capt. M. S. Briscoe's collection of reptiles and amphibians from Harbel, Liberia.*[1] ARTHUR LOVERIDGE. (Communicated by HERBERT FRIEDMANN.)

Through the courtesy of Dr. Doris M. Cochran, I have been able to examine the herpetological collection made by Capt. M. S. Briscoe, part of which was presented by him to the United States National Museum, part to the Museum of Comparative Zoology, and the remainder to Howard University. The collection contains a very large example of *Thrasops occidentalis*, the only specimen of this rare tree snake in any museum in the United States. There are no fewer than ten other species of snakes not taken at Harbel by the Smithsonian-Firestone Expedition of 1940, which collected there. Captain Briscoe is to be congratulated on taking advantage of this opportunity to extend our knowledge of the herpetofauna of the Republic of Liberia.

LIZARDS

Varanus niloticus ornatus (Daudin)

1803. *Tupinambis ornatus* Daudin, Hist. Nat. Rept. 8: 353; Malimbe, Cameroon (restricted by Mertens).

juv. (U.S.N.M. 122266)

[1] Received April 8, 1946.

This 360 (135+225) mm monitor, having five transverse rows of spots between fore and hind limbs, conforms to this race as defined by Mertens (Abh. Senckenberg. Naturf. Ges., No. 466:320. 1942) in his recent revision of the family. *V. n. ornatus* is the sylvicoline race, with the typical form occupying the savanna regions of Liberia.

Mabuya blandingii (Hallowell)

1844. *Euprepes blandingii* Hallowell, Proc. Acad. Nat. Sci. Philadelphia, 1844: 58; Liberia.

1 (U.S.N.M. 122267)

Quite typical of Blanding's skink, of which *frenatus* (Hallowell) is a synonym. Length 185 (75+110) mm.

SNAKES

Calabaria reinhardtii (Schlegel)

1848. *Eryx reinhardtii* Schlegel, Bijdr. Dierk. 1: 3, pl. —; Gold Coast.

♂ ♂ (M.C.Z. 49014; Howard Univ.)

Midbody scalerows 30–32; ventrals 222 (in both); anal 1; subcaudals 23 (in both); 2 superposed loreals, except on left side of U.S.N.M. 122226; preocular 1, except on left side of M.C.Z. 49014, where there are 2. Larger ♂ 870 (800+70) mm.

Natrix anoscopus anoscopus (Cope)

1861. *Tropidonotus anoscopus* Cope, Proc. Acad. Nat. Sci. Philadelphia, 1861: 299; "Cuba" (error, probably Liberia).

♂ ♀ ♀ ♀ (U.S.N.M. 122237; M.C.Z. 49015; Howard Univ.)

Midbody scalerows 23–25; ventrals 138–141; anals 2; subcaudals 64–71; preoculars 1–2; postoculars 1–2; suboculars 3. Largest ♀ 565 (425+140) mm.

Boaedon lineatus lineatus Duméril and Bibron

1854. *Boaedon lineatus* Duméril and Bibron, Erpétologie générale 7: 363; Gold Coast.

♀ ♀ ♀ (U.S.N.M. 12233; Howard Univ.)

Midbody scalerows 29–32; ventrals 216–220; anal 1; subcaudals 50–54; preoculars 2; postoculars 2; temporals 1+2, rarely 1+1. Largest ♀ 779 (680+99) mm.

Boaedon lineatus virgatus (Hallowell)

1854. *Coelopeltis virgata* Hallowell, Proc. Acad. Nat. Sci. Philadelphia 1854: 98; Liberia.

♂ (Howard Univ.)

Midbody scalerows 21; ventrals 60; anal 1; subcaudals 60; preocular 1; postoculars 2; temporals 1+1. Length 360 (305+55) mm.

I have previously recorded both races of the house snake from Liberia; now it appears that both may occur in the same locality. The typical form is a savanna reptile, while *virgatus* with its gray-flanked ventrals and gray subcaudals is a sylvicoline race. This arrangement is paralleled in the Republic by other species like the savanna *Varanus n. niloticus* and its forest-dwelling form *V. n. ornatus*.

Thrasops occidentalis Parker

1940. *Thrasops occidentalis* Parker, Ann. Mag. Nat. Hist., ser. 11, 5: 273, figs. 1 and 2a; Axim, Gold Coast.

♀ (U.S.N.M. 122257)

Midbody scalerows 15; ventrals 187; anals 2; subcaudals 132; labials 8, fourth and fifth entering orbit; preocular 1; postoculars 3; loreal 1; temporals 1+1. Length 1565 (1115+450) mm.

The occurrence of this rare species in Liberia was previously known only from a paratype male from Monrovia. This, the second known female, is not only the largest example known, but is the first of its species to reach any museum in the United States.

Since my revision of the genus *Thrasops* (Bull. Mus. Comp. Zoöl. 95: 121–247. 1944) C. M. Bogert has invited my attention to the fact that *Ahaetulla occidentalis* Günther, 1859, was erroneously placed in the genus *Thrasops* by Cope, 1860. As this is a secondary homonym it in no way invalidates Parker's use of the name in *Thrasops*.

Boiga pulverulenta (Fischer)

1856. *Dipsas pulverulenta* Fischer, Abh. Geb. Naturw. Hamburg 3: 81, pl. 3, figs. 1a–1c; Edina, Grand Bassa County, Liberia.

♂ (U.S.N.M. 122230)

Midbody scalerows 19; ventrals 260; anal 1; subcaudals 132; preocular 1; postoculars 2; temporals 2+2. Length 912 (720+192) mm.

Boiga blandingii (Hallowell)

1844. *Dipsas Blandingii* Hallowell, Proc. Acad. Nat. Sci. Philadelphia, 1844: 170; Liberia.

♂ (U.S.N.M. 122255)

Midbody scalerows 23; ventrals 273; anals 2; subcaudals ?; preoculars 2; postoculars 2; temporals 2+2. Length 1973+ (1730+243+) mm.

This is an exceptionally large example, for Blanding's tree snake rarely exceeds 6 feet.

Psammophis sibilans phillipsii (Hallowell)

1844. *Coluber Phillipsii* Hallowell, Proc. Acad. Nat. Sci. Philadelphia 1844: 169; Liberia.

♂♂ ♀ ♀ (U.S.N.M. 122253; M.C.Z. 49016; Howard Univ.)

Midbody scalerows 17; ventrals 161–175; anal 1; subcaudals 91–97; labials 8, 4th and 5th entering orbit; nasals 2–3; preocular 1; postoculars 2; temporals 2+2 or 2+3. Largest ♀ 1262 (880+382) mm.

Thelotornis kirtlandii kirtlandii (Hallowell)

1844. *Leptophis Kirtlandii* Hallowell, Proc. Acad. Nat. Sci. Philadelphia 1844: 62; Liberia.

juv. (Howard Univ.)

Midbody scalerows 19; ventrals 174; anals 2; subcaudals 154; preocular 1; postoculars 3; temporals 1+2. Length 632 (395+237) mm.

Miodon acanthias (Reinhardt)

1860. *Urobelus acanthias* Reinhardt, Vid. Medd. Kjøbenhavn 1860: 229, pl. 3; Guinea.

juv. (U.S.N.M. 122250)

Midbody scalerows 15; ventrals 188; anal 1; subcaudals 22; preocular 1; postoculars 2; temporals 1+1. Length 186 (170+16) mm. Almost certainly a male, this is about the tenth known example of the species.

Aparallactus modestus (Günther)

1859. *Elapops modestus* Günther, Ann. Mag. Nat. Hist., ser. 3, 4: 161, pl. 4, fig. C; West Africa.

♂ ♀ (U.S.N.M. 122229; Howard Univ.)

Midbody scalerows 15; ventrals 143–160; anal 1; subcaudals ?; preocular 1; postoculars 2; temporal 1. Length ?, as tails truncate.

Dendroaspis viridis (Hallowell)

1844. *Leptophis viridis* Hallowell, Proc. Acad. Nat. Sci. Philadelphia 1844: 172; Liberia.

♂♂ (M.C.Z. 49017; Howard Univ.)

Midbody scalerows 13; ventrals 213–218; anals 2; subcaudals 112–118; preoculars 2+1; subocular; postoculars 3+1 or 0 subocular; lower temporal absent in one specimen, having fused with the labial. Larger ♂, 1760 (1305+455) mm.

Causus rhombeatus (Lichtenstein)

1823. *Sepedon rhombeatus* Lichtenstein, Verz. Doubl. zool. Mus. Berlin 1823: 106; no type locality.

7♂♂, 3♀♀ (U.S.N.M. 122245–48; Howard Univ.)

Midbody scalerows 19; ventrals 121–137; anal 1; subcaudals 17–22; mostly paired; preoculars 2; postoculars 2; suboculars 1–3; temporals 2+3. Largest ♂, 443 (400+43) mm, and ♀ 431 (395+36) mm.

The rhombic night adder, so common in Liberia, supplied the motif for the pattern on an armlet, worked in black and yellow grass, brought back in 1944 by Dr. J. C. Bequaert from a village near Kolahun, Republic of Liberia.

Bitis gabonica (Duméril and Bibron)

1854. *Echidna Gabonica* Duméril and Bibron, Erpétologie générale 7: 1428, pl. 80B; Gaboon.

Head and skin (Howard Univ.)

Midbody scalerows 35; ventrals 132; anal 1; subcaudals 19; upper labials 14–14. A fine large example of the Gaboon viper.

Atheris chloroechis (Schlegel)

1855. *Vipera chloroechis* Schlegel, Versl. Akad. Amsterdam 3: 317.

♀ (Howard Univ.)

Midbody scalerows 29; ventrals 157; anal 1; subcaudals 58; interorbitals 10+2 circumorbitals; circumorbitals 18–19; upper labials 11. Length 390 (330+60) mm.

AMPHIBIA

Geotrypetes seraphini occidentalis Parker

1936. *Geotrypetes seraphini occidentalis* Parker, Zool. Meded. 19: 99; Grand Cape Mountain, Liberia, etc.

1 (U.S.N.M. 122261)

This well-preserved caecilian has 102 primary and apparently 38 secondary folds. In the latter respect it does not conform to Parker's definition of the western race. Length 290 (289+2) mm.

Rana occipitalis Günther

1858. *Rana occipitalis* Günther, Cat. Batr. Sal. Brit. Mus.: 130, pl. 11; Gambia (restricted).

3 juv. (U.S.N.M. 122262–3; M.C.Z. 26136)

Ranging in head and body length from 33–40 mm, these are the smallest bullfrogs of this species I have seen. As they lack the characteristic transverse occipital fold connecting the posterior corners of the orbits, they fail to

conform to the key I devised (1941, pp. 13–4 135) to differentiate the nine members of the genus *Rana* found in the Republic of Liberia.

Megalixalus fulvovittatus (Cope)

1860. *Hyperolius fulvovittatus* Cope, Proc. Acad. Nat. Sci. Phila. 1860: 517; Liberia.
♀ (U.S.N.M. 122265)

This 26-mm striped sedge frog is quite typical of the species, with which I have synonymized *Hyperolius vittiger* (Peters).

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Obituary

GLENN LANE PARKER died suddenly at his home on February 12, 1946, having worked during the forenoon of that day at his office in the U. S. Geological Survey. He was born on December 23, 1884, in the small mining town of Wickes, near Butte, Mont., received his early education in the public schools of Kansas, was graduated in civil engineering by the University of Kansas in 1906, and continued in graduate work at that institution until June 1908. Shortly thereafter he entered the Federal service as deck officer in the U. S. Coast and Geodetic Survey, from which he was transferred on January 1, 1909, to water investigations in the Geological Survey in which he spent the rest of his life. He served first in the Seward Peninsula, and later in the Yukon-Tanana region of Alaska. In April 1911 he was assigned to the Survey's Columbia River district, and in March 1913 he was made district engineer for the State of Washington with headquarters in Tacoma, where he filled this position until October 1939 when he was made chief of the Survey's Water Resources Branch and was transferred to Washington, D. C. He continued in the latter position until his death.

During the 26-year term of service as district engineer in the State of Washington, Mr. Parker became known as an outstanding authority in national and international problems related to the quantity, control, and utility of the waters of the Columbia River Basin. In the following six years, when he was chief of the Water Resources Branch, he served as adviser of the International Joint Commission on problems related not only to the waters of the Columbia River Basin but also to those of the whole Canadian boundary. He served with a Canadian engineer as a two-man board to divide the waters of the Milk and St. Mary Rivers, in accordance with a rule adopted by the International Joint Commission. Since 1944 he served as a member of the International Columbia River Engineering Board, which is investigating the international features of the utilization of the waters of Columbia River. He was active in the studies of water utilization in connection with the recently executed treaty with Mexico which provided for the equitable division of the waters of the Rio Grande and of the Colorado and Tia Juana Rivers between the United States and Mexico. He was appointed by President Roosevelt as the United States representative on the Republican River Compact Commission and in that capacity was active in drafting the compact between the States of Colorado, Kansas, and Nebraska for the division and control of the waters of the Republican River Basin.

He was author or joint author of many reports on the Nation's water resources, especially those of the Pacific Northwest and Alaska. He was a member of American Society of Civil Engineers and was active in its affairs, having served in important committee assignments and as a director during 1939 and 1940.

On December 16, 1914, he married Grace Imogene Guy, of Washington, D. C., who survives him. Their only son, Lt. (jg) Glenn Guy Parker, who enlisted in the Navy on his graduation from Stanford University in 1941 and became a dive-bomber pilot, was killed on December 27, 1943, by the crash in the Southwest Pacific of a transport plane on which he was a passenger.

Mr. Parker was a hard and efficient worker, a keen analyst of great technical ability, and a cooperative leader in his fields of activity and interest. He became, therefore, a great producer of valuable results in the investigation of the Nation's invaluable water resources. His record of accomplishment is his enduring monument.

CARL G. PAULSEN